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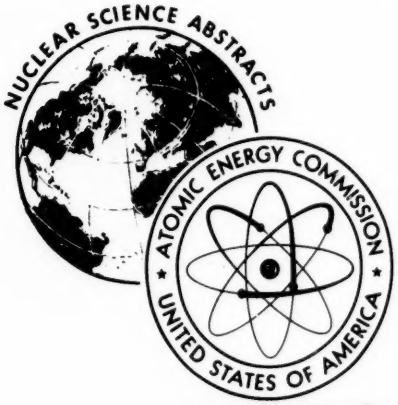

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Volume 20 Number 19

Abstracts 35192–36541

October 15, 1966

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Volume 20, Number 19, October 15, 1966

NUCLEAR SCIENCE ABSTRACTS

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Volume 20, Number 19 October 15, 1966

NUCLEAR SCIENCE ABSTRACTS

BIOLOGY AND MEDICINE

General

35192 ACTIVATION ANALYSIS IN DENTAL MEDICINE. Nixon, G. S. (Glasgow Univ.). pp 133-8 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

The three main theories for the cause of dental caries are reviewed, and the role of trace elements in their prevention is discussed with emphasis on the use of activation-analysis techniques. (P.C.S.)

35193 INFRARED SPECTROSCOPIC STUDY OF HELIX-COIL TRANSITIONS OF DESOXYRIBONUCLEIC ACID IN DEUTERIUM OXIDE. Fritzsche, H. (Deutsche Akademie der Wissenschaften, Berlin. Institut fuer Mikrobiologie und Experimentelle Therapie, Jena, Ger.). Biochim. Biophys. Acta, 119: 645-6(June 22, 1966). (In German).

The infrared spectroscopic method was found to be suitable for characterizing the helix-coil transition of DNA solutions. The method can also be used for very concentrated solutions. Other advantages of the method are indicated. (J.S.R.)

35194 ANALYSIS OF THE POSSIBILITY OF BREEDING CONSTANT 56-CHROMOSOMAL TRITICUM x AGROPYRON HYBRIDS FOR FERTILITY INCREASE. Golubovskaya, I. N.; Nikoro, Z. S.; Khvostova, V. V. (Inst. of Cytology and Genetics, Academy of Sciences, Novosibirsk, USSR). Genetika, No. 4, 86-96(Apr. 1966). (In Russian).

Percentage of tetrads with irregularities, percentage of sterile pollen, and seed productivity grade in separate self pollinated lines of a 56-chromosome Triticum × Agropyron hybrid (J_2 from γ-irradiated seed at a dose of 10 kR) were studied. The data obtained were subjected to the method of dispersion analysis which has shown that the highest degree of genetical variation among the lines is expressed by the character of meiosis. Dividing the general phenotypical variance into components according to the three features mentioned above showed that variation depends mostly on random variability and correspondingly equals 90.7, 90.5, and 81.2%. Lines should be selected according to high indexes of the features studied and simultaneously low value of the quadratic deviation. Study of correlations between a given pair of features showed that the highest correlation exists between meiosis and seed productivity (−0.613 ± 0.133). The values of the other two correlation coefficients are insignificant and unreliable. The data obtained suggest that selection for regular course of meiosis may give better results regarding fertility increase in Triticum × Agropyron hybrids than selection for seed productivity. (auth)

35195 FLIGHT RANGE, LENGTHS OF GONOTROPHIC CYCLES, AND LONGEVITY OF ^{32}P-LABELED ANOPHELES STEPHENSI MYSORENSIS. Quraishi, M. Sayeed (Univ. of Manitoba, Winnipeg, Can.); Faghih, M. A.; Esghi, N. J. Econ. Entomol., 59: 50-5(Feb. 1966).

Flight range and lengths of gonotrophic cycles in nature was studied in A. stephensi mysorensis, the main vector of malaria with epidemic potential in southern Iran, with ^{32}P-labeled mosquitoes. Two series of 3 releases at 3-day intervals were made, about 190,000 mosquitoes being released and 287 recaptured. Larvae were labeled by placing 15 μC of ^{32}P in 1.5 liters of water which contained 750 larvae. The average count rates/male and female were 4000 and 5000 count/min, respectively. Cages containing unfed ^{32}P-labeled mosquitoes which had emerged overnight were transported to the site of release. Both male and female mosquitoes were found to fly 1.8 km overnight. Tagged mosquitoes were captured up to a distance of 4.5 km. First gonotrophic cycle was completed in 3−4 days and the second in 6−8 days. The figures indicated a marked fall in the density of radioactive mosquitoes in going from 1−3 to 3−5 km. The figures obtained for each day when plotted against time on a semilog scale fall on a straight line for the 1st 6 days, indicating that the daily mortality rate for females is exponential. The number of radioactive mosquitoes captured after the 6th day was too small to be of any value in determining the mortality rate. Radioactive mosquitoes were captured only during the 1st 9 days after each release. (BBB)

35196 RADIATION EXPOSURE IN PARENTS OF MONGOLS. Lancet, 1: 193(Jan. 22, 1966).

Recent reports implicating medical irradiation in the etiology of mongolism (Down's syndrome) are briefly reviewed. Since there are abnormal chromosomes in mongolism, and ionizing radiation may damage chromosomes, evidence of increased radiation exposure has been sought in the parents of mongol children. One study compared the parents of 216 mongoloid children (mongol group of parents) with the parents (control group) of normal children matched with the mongols for hospital of birth, date of birth, sex, and maternal age at birth. Most of the radiation exposures had been in private clinics or doctors' offices rather than in hospitals, and the hospital records were chiefly used as a check on the comparability of the groups. Radiation exposures were divided into diagnostic (excluding fluoroscopy), fluoroscopic, therapeutic, and occupational. It was found that there was no concentration of exposures before the birth of a child. Differences between the two groups were not significant, except for fluoroscopy and radiotherapy. Of the mothers of mongol children, 17.7% had had one or more fluoroscopic exposures before the child was born, but only 8.1% of the control mothers; 14.5% of the mothers of mongol children had been exposed to radiotherapy (8.8% for skin conditions), compared with 5.1% of the control mothers (2.3% for skin conditions). Though no difference was found between the groups in occupational exposure to ionizing radiation, two differences were found: 7.9% of the mothers of mongols had been employed in medicine compared with 3.3%

of the controls, and incidental exposure is possible. Also, 8.7% of the fathers in the mongol group had worked with radar, and 3.2% in the control group. This was the only significant difference between the two groups of fathers. Considering all kinds of ionizing radiation, 50% of the mothers in the mongol group had never been exposed at all, compared with 60% of those in the control group; while 13 mothers in the mongol group, but only 2 in the control group, had been exposed to more than one kind (diagnostic, fluoroscopic, therapeutic) of radiation. All these differences are significant at the 5% level at least. (BBB)

35197 HYPOTHYROIDISM IN ATOMIC BOMBING CASUALTIES. Yasuhi, Susumu; Mukai, Mudeaki; Uemura, Seizi; Tanaka, Tosikazu; Hamasima, Masazumi; Kuratsune, Hiromasa (Nagasaki Atomic Bomb Hospital). Nagasaki Igakkai Zasshi, 38: Suppl., 99 103(Dec. 1963). (In Japanese).

From May 1958, to September 30, 1962, there were 14,533 outpatients in this hospital and 149 patients with thyroid disorders (1.03%), among which were 11 hypothyroidism cases. There were also 69 nodular and simple goiter cases, 51 of hyperthyroidism, and 18 with thyroid malignancy. Patients who had been within 2 km of the hypocenter were most prevalent in cases of malignancy as compared with the more distantly exposed. The ratio of hyperthyroidism and hypothyroidism cases was 4.6 : 1, which is higher than that of an earlier report. Hypothyroidism was most frequent in persons 40 to 60 years of age, with an average age of 47.7 years. Two cases had shown acute radiation sickness soon after exposure. All had no history of exposure to hypothyroidism-causing drugs. All cases developed symptoms of myxedema 6 to 10 years after the atomic bomb explosion. None showed palpable thyroid tumor. None had any abnormality in hypophyseal and adrenal function. Clinical and lab findings are described. All cases improved after desiccated thyroid administration. (BBB)

35198 TWELVE CASES OF MULTIPLE MYELOMA IN NAGASAKI (ESPECIALLY SEVEN ATOMIC BOMBING CASUALTY CASES). Ichimaru, Michito; Yasuhi, Susumu; Ouchuru, Sin (Nagasaki Atomic Bombing Hospital). Nagasaki Igakkai Zasshi, 38: Suppl., 109 13(Dec. 1963). (In Japanese).

Since 1958, there have been 12 cases of multiple myeloma in Nagasaki, and among them were 7 cases representing atomic bombing casualties, with 3 cases being within 2 km distance from the hypocenter. The age of onset was between 51 and 69 years, and the sex ratio was 8 : 4, it occurring mostly in males. Symptoms were predominantly low back pain and chest pain caused by the bone changes in 8 cases. Two cases complained of general malaise and palpitation which resulted from anemia. One developed persistent epistaris, and another complained of diplopia caused by the paralysis of the oculomotor nerve. Peripheral blood in all cases showed anemia, 9 with hyperchromic and 3 with normochromic or hypochromic anemia. Low platelet counts were seen in 3 cases. All showed leukopenia. All cases showed typical γ-globulin change with a myeloma peak, and in 4 cases showed an increase of β-globulin. Bence-Jones proteinuria was present in 5 cases. Average course was 1 year 4 months. Among complications, myeloma nephrosis, aplastic anemia, and pneumonia were the most important ones. (BBB)

35199 HYDROGEN ADDITION RADICALS ON RNA AND THE NUCLEIC-ACID BASES AT 77 DEG K. Herak, J. N.; Gordy, W. (Duke Univ., Durham, N. C.). Proc. Nat. Acad. Sci. U. S., 55: 1373-8(June 1966).

An experiment was designed for the bombardment of samples with H and D atoms at reduced temperatures down to that of liquid nitrogen, 77°K, and for observation of the ESR of the bombarded samples at the lowered temperature. As a result, it was proved that H and D addition occurs in RNA on both a purine and a pyrimidine ring. Addition was found to occur on cytosine at the lowered temperature. The H-addition on thymine, uracil, and guanine, previously observed at room temperature, was found to occur at 77°K also. In contrast to RNA, no signals from H-addition radicals were observed from atomic bombardment of DNA at room temperature or at liquid nitrogen temperature. The only signal observed was the broad singlet characteristic of DNA treated with radiation at room temperature. (P.C.H.)

35200 STUDY OF THE CELLULARITY OF HEMATOPOIETIC ACTIVITY AND CERTAIN PROBLEMS OF MYELOPERFUSION IN MARROW APLASIA. Rosin, S. (Inst. of Oncology, Bucharest). Sangre, 9: 355-8(1964). (In French).

Some parameters of human bone marrow cells were studied in relation to bone marrow transplantation, and some data on radiobiologic experiments in dogs and rabbits are reported. Normal human bone marrow was found to have an average of 6,500,000 ± 90,000 cells/mm^3. The volume of hematopoietic marrow was estimated to be 1500 ml, with a total of 975×10^9 nucleated cells in the adult. Young proliferative granulopoietic marrow cells, capable of synthesizing DNA, accounted for 21% of the total, or 205×10^8 cells. Nonproliferative cells in the leukocyte series represented 44%, or a total of 430×10^9 cells. For each of the 22.5×10^9 granulocytes in circulating blood, there were 9 blast cells in bone marrow. The total number of granulocytic elements is 19 times higher in bone marrow than in circulating blood. The daily production of granulocytes was estimated to be 1.06×10^9. Studies are also reported wherein autologous infusions of marrow cells (1 to 3×10^9), preserved at −80°C, were used to stimulate hematopoiesis after treatment with cytostatic agents. In dogs x irradiated with lethal doses (450 to 600 R) and rabbits exposed to 1000 R, it was possible to prolong the life of the animals and stimulate hematopoiesis by repeated bleedings. (BBB)

Ecology

35201 EFFECTS OF SHORT-TERM GAMMA IRRADIATION ON AN OLD FIELD. Monk, C. D. (Univ. of Georgia, Athens). Contract AT(38-1)-310. Radiat. Bot., 6: 329-35(Aug. 1966).

A 12-year-old field that had been planted in longleaf pine 5 years previously was exposed for 400 hr to a 9200 C ^{137}Cs irradiator in May 1965. Exposure for 400 hr was not sufficient to establish vegetation zones corresponding to different radiation levels, however, Fimbristylis autumnalis did invade the 160 kR zone following exposure. Changes in floristic composition along a radiation gradient exhibited a 50% reduction in similarity and diversity at 530 and 750 R/day, respectively. Root biomass production decreased with increased radiation. The reduction was related to direct radiation damage and to indirect damage through the death of shoots followed by root degradation. Terminal stem elongation in longleaf pine was reduced to 50% by 1 R/day. At the end of the 1965 growing season, mortality resulted in all pine that received 9000 R. (auth)

Metabolism, Tissue Distribution, and Toxicology

Refer also to abstract 35708.

35202 PERCUTANEOUS ABSORPTION OF SODIUM CHROMATE (^{51}Cr), COBALTOUS (^{58}Co), AND MERCURIC (^{203}Hg) CHLORIDES THROUGH EXCISED HUMAN AND GUINEA PIG SKIN. Wahlberg, Jan E. (National Inst. of Public Health, Stockholm). Acta Dermato-Venerol., 45: 415-26(1965).

Radioactivity disappearance measurements were used to study the percutaneous absorption rate of radioisotopes. For 48 hr, aqueous solutions of 0.034M $Na_2{}^{51}CrO_4$, 0.085M $^{58}CoCl_2$, and 0.005, 0.080, and 0.239M $^{203}HgCl_2$ were applied to excised human (abdominal, mammary) and guinea pig whole skin. The skin was clamped in a Perspex diffusion chamber where temperature, flow rate, and bathing solution could be varied. As a supplementary study the bathing

solution was also analyzed; absorption was found to be lower than when disappearance measurements were used. Possible explanations of this discrepancy are given. Comparison of absorption through guinea pig skin during the first five hours showed that the in vivo/in vitro rates ratio varied in the five given concentrations between 0.1 and 1.4. In the highest $^{203}HgCl_2$ concentration (0.239M) the observed lower absorption rate in vivo was statistically significant. During the first five hr absolute absorption through human and guinea pig skin in vitro increased with increasing concentration of $^{203}HgCl_2$. This was different from the in vivo observations where a plateau value was obtained. The mean absorption rate for the five given concentrations was 3.1 times greater through freshly excised guinea pig skin compared to stored, human abdominal skin. The mean absorption rate of 0.080M $^{203}HgCl_2$ was 1.8 times greater through freshly excised guinea pig skin when compared to freshly excised human mammary skin, 1.7 times greater through stored excised human mammary skin than stored human abdominal skin, and 1.1 times greater through stored mammary skin than freshly excised mammary skin. (BBB)

35203 WHOLE-BODY COUNTER IN ROUTINE TESTS OF HYPERTHYROIDISM USING ^{131}I. Pope, R. A. (Cambridge Univ., Eng.). Acta Radiol. Therapy, Phys., Biol., 4: 187-208(June 1966).

With the aid of a whole-body counter and a low background steel room, a discriminating test for hyperthyroidism in adults may be performed with 0.1 μC iodine-131 using the whole-body retention at 48 hours as an index of thyroid function. It is suggested that reduction of the administered dose is desirable in many patients, particularly with the increasing use of iodine-131 for routine tests in subjects most susceptible to radiological hazards. (84 references). (auth)

35204 USE OF DEUTERIUM OXIDE FOR THE DETECTION OF WATER BINDING OF HELICAL STRUCTURES IN NUCLEIC ACIDS AND IN POLYNUCLEOTIDES. Lewin, S. (South-West Essex Technical Coll., London). Arch. Biochem. Biophys., 115: 62-6(July 1966).

Collation of the H-water-bridge theory and the thesis that the D-bond is stronger than the H-bond leads to the expectation that the melting temperature values of nucleic acids at low ionic strengths should be higher in D_2O than in H_2O. This was confirmed in the case of salmon-sperm DNA over the pH range of 4.5–7.5 at 10^{-3} ionic strength. The further expectation that under certain conditions D_2O substitution should result not only in rise in melting temperature but also in increased hypochromicity was confirmed using synthetic polynucleotides. (auth)

35205 EFFECTS OF D_2O ON CITRIC ACID AND PYRUVATE CARBOXYLASE FORMATION BY ASPERGILLUS NIGER. Henderson, T. R.; Lamonds, M. R. (Univ. of Arkansas, Little Rock). Arch. Biochem. Biophys., 115: 187-91(July 1966).

In a D_2O medium, the growth of Aspergillus niger is retarded and citric acid production is repressed. The citrate synthase activity of D_2O-grown mycelia is higher than the activity of H_2O-grown mycelia. Pyruvate carboxylase is absent in extracts of D_2O-grown mycelia although H_2O-grown mycelia are highly active. The direct effect of D_2O on in vitro assays of pyruvate carboxylase is negligible. These results suggest that D_2O interferes with the synthesis of certain enzymes possibly through effects on repressor type mechanisms. (auth)

35206 ^{59}Fe ABSORPTION IN HUMAN SUBJECTS USING TOTAL-BODY COUNTING TECHNIC. Pollack, Simeon (Walter Reed Army Inst. of Research, Washington, D. C.); Balcerzak, Stanley P.; Crosby, William H. Blood, 28: 94-7(July 1966).

In most procedures utilizing whole-body counting to measure ion absorption in humans, the assumption is made that iron located in the gastrointestinal tract is counted with the same efficiency as ^{59}Fe distributed throughout the body. This assumption was found to be in error in a significant number of subjects. (auth)

35207 STIMULATION OF THE PROTEIN METABOLISM OF ACUTE HUMAN LEUKEMIA CELLS WITH NATIVE RNA EXTRACTED FROM NORMAL HUMAN BONE MARROW. Bachi, C.; Pegorado, L.; Pileri, A.; Gavosto, F. (Univ., Turin). Boll. Soc. Ital. Biol. Sper., 40: 643-5(1964). (In Italian). (EUR 2255.i).

The influence of native RNA from normal human bone marrow on the incorporation of tritiated leucine into acute leukemia blast cells cultured in vitro was studied by means of autoradiography. The addition of RNA to the cultures was found to increase significantly the incorporation. (auth)

35208 DIFFERENCES BETWEEN THE MICROSOMES OF NORMAL RAT LIVER AND OF N-2-FLUORENYLACETAMIDE-INDUCED RAT HEPATOMA AS DETERMINED BY THE PAIRED LABEL ANTIBODY TECHNIC. Isojima, Shinzo; Planinsek, Jakob; Yagi, Yasuo; Pressman, David (Roswell Park Memorial Inst., Buffalo). Cancer Res., 26: 1527-33(July 1966).

Rabbit antibodies against the microsome fractions of a chemically induced rat hepatoma and of normal rat liver were compared by the paired label radioantibody technique. The antihepatoma antibodies were labeled with ^{125}I and the anti-normal-liver antibodies were labeled with ^{131}I. The 2 were mixed and then injected or treated in vitro simultaneously. The 2 antibodies differed in vivo in their localizing properties in hepatoma and in normal liver. They were fractionated in vitro into fractions containing hepatomaphilic or normal-liver-philic antibodies. The results indicate differences in the antigen composition between the microsome fractions of the 2 tissues as well as differences in the antibody composition between the antisera produced against these preparations. (auth)

35209 EXPERIMENTAL INVESTIGATIONS ON PENETRATION OF RADIOACTIVE CHROMIUM(^{51}Cr) THROUGH THE SKIN. Czernielewski, A.; Brykalski, D.; Depczyck, D. (Klinika Dermatologiczna, Lodz, Poland). Dermatologica, 131: 384-96(1965).

The absorption of ^{51}Cr, as Na_2CrO_4, by guinea pig skin was studied. A 150-μC dose was applied to the shaved skin as a 0.1 ml solution in saline. Twenty-four hr later radioactivity in blood and various organs was determined. Sp act. generally declined in the following order: urine > feces > liver > blood > kidney > heart. In other experiments a 0.5N NaOH solution was applied to skin for one week before ^{51}Cr. Increased absorption as well as excretion of ^{51}Cr was noted. When a protective ointment was first applied to the skin, ^{51}Cr absorption from skin was lower than that seen in the control group, although its excretion was enhanced. In animals previously sensitized to Cr, absorption of ^{51}Cr from the skin was lower than in the other groups. (BBB)

35210 RADIOISOTOPE MEASUREMENT OF FOOD CONSUMPTION BY A LEAF BEETLE SPECIES, CHRYSOMELIA KNABI BROWN. Crossley, D. A. Jr. (Oak Ridge National Lab., Tenn.). Ecology, 47: 1-8(Winter 1966) (ORNL-P-257)

A radioisotope method was used previously for estimating vegetation consumption by a community of about 400 species of insects living on an area contaminated with radioactive waste effluents, the White Oak Lake bed at Oak Ridge, Tennessee. Insects feeding on radioactive plants accumulated radiocesium and reached a steady-state equilibrium concentration, in which intake of ^{137}Cs was balanced by its elimination of ^{137}Cs. Information on biological half-lives (elimination rates) for cesium provided the means for estimating ^{137}Cs intake. A study was undertaken to evaluate such a radioisotope technique by using a single insect species, for which the rate of food consumption could be measured both by radioactive tracer methods and by weighing the food in controlled experiments. Thus the uptake of ^{137}Cs was investigated for beetle larvae (Chrysomelia knabi) feeding on willows in the White Oak Lake bed. Food intake rates were estimated from radiocesium intake rates by measuring ^{137}Cs concentrations in willow leaves. Food intake rates estimated by this method for field areas were 7 to 16 mg dry wt of plant per larva per day. Lab measurements of food consumption rates, by

comparison, were about 9 to 10 mg/larva per day for larvae of similar size. Influences of temperature on biological half-lives were also studied, but no correction was applied to the field estimates since mean field temperatures were close to those used in lab experiments. The good agreement between lab and field measurements supports the validity of previous applications to entire communities of plant-feeding insects. The method would be equally useful with predaceous animals as with herbivores. (BBB)

35211 CHANGES IN THE ^{131}I CONVERSION RATIO AND $PB^{131}I$ IN HOT THYROID NODULES INDEPENDENT OF TSH. **Gasiorowski, Wiktor; Czech, Wlodzimierz (Postgraduate Medical School, Warsaw). Endokrynol. Pol., 16: 37-46(Jan.-Feb. 1965). (In Polish).**

So-called hot thyroid nodules, which in the scintigram show an accumulation of radioiodine greater than that of the surrounding thyroid parenchyma, secrete hormonally active substances usually independently of pituitary thyrotropin (TSH) but inhibit the release of endogenous TSH. Therefore, normal thyroid tissue loses its hormonal activity while the nodules, which are autonomous, continue to secrete active hormone. Administration of triiodothyronine or desiccated thyroid does not suppress radioiodine uptake by these nodules but totally inhibits the low uptake by extranodular tissue. Administration of TSH as well as surgical or ^{131}I ablation of the nodule restores radioiodine uptake by the extranodular thyroid parenchyma. Triiodothyronine administration failed to lower the results of ^{131}I conversion ratio, PB ^{131}I determination, and 24-hr thyroid uptake in most of the 24 cases of hot thyroid nodules studied, both toxic and nontoxic. On the contrary, a slight elevation of these indices was usually seen. Administration of thyrotropin produced an increase in these values that was smaller than in normal subjects or patients with nontoxic goiter but greater than in Graves disease. These results indicate that hot thyroid nodules functioning independently of TSH have certain features which distinguish them from TSH-dependent nodules. This distinction is more evident with respect to hot, clinically toxic nodules than with respect to the nontoxic ones. An important characteristic of hot nodules in that triiodothyronine inhibition fails to lower the thyroid ^{131}I uptake, conversion ratio or $PB^{131}I$. This shows that the nodules are autonomous and independent of pituitary TSH. The observation that in some instances of hot nodules thyroid preparations did lower 24-hr conversion and $PB^{131}I$ suggests that such nodules might present intermediate forms between TSH-dependent and TSH-independent classes. Analysis of the scintigram of these nodules shows that uptake suppression of the thyroid parenchyma adjoining the nodules is not as complete as in case of the nodules which showed no decrease in the indices of thyroid function after triiodothyronine inhibition. (BBB)

35212 ACCUMULATION OF ^{131}I BY CHANNEL CATFISH (ICTALURUS PUNCTATUS) OVARIES IN VIVO AND IN VITRO. **Lindsay, Raymond H.; Romine, Cynthia; Zacharewicz, Frank; Dupree, Harry K.; Sneed, Kermit E. (Veterans Administration Hospital, Birmingham, Ala.). Gen. Comp. Endocrinol., 6: 231-8(Apr. 1966).**

Radioiodine metabolism was studied in channel catfish, a nonmigratory, fresh-water teleost, with special emphasis on the role of the ovaries which appear to be the major iodide-concentrating organ in this species. In ovaries, ^{131}I accumulation reached a peak 20–30 hr after injection. Ovaries accounted for 45.0% of the injected dose after 24 hr while the thyroid accounted for only 2.43%. Accumulation of ^{131}I in the ovaries occurred against a concentration gradient with ovary-to-blood ratios after 24 hr of 32:1. Accumulation of ^{131}I in fish ovaries accumulated in vitro appeared to be predominately in an inorganic form. However, seasonal variations were noted in which ^{131}I uptake by ovaries obtained in June, as opposed to those obtained in January, appeared to be more firmly bound to the tissue. Traces of ^{131}I were present in the protein band after electrophoresis of tissue homogenates, and 2–5% of the ^{131}I was associated with protein after paper chromatography. The physiological role of iodide in the ovary, if any, is not known; however, the ovary tends to act as a reservoir for iodide which is released over a prolonged period resulting in relatively constant thyroid levels of ^{131}I for as much as 10 days. Metabolism of iodide in the mammary gland, the ovary and the placenta may be an adaptation which assures the embryo its iodide requirements. In the ovaries of certain fish such as channel catfish, the ovary (or eggs) may act as an iodide store for the developing embryo. This would be especially important in species that range in or spawn in waters that exhibit wide variations in iodide content. (BBB)

35213 ORAL THERAPY FOR DEPOSITED PLUTONIUM. **Ballou, J. E.; Palotay, J. L. (Battelle Memorial Inst., Richland, Wash.). Health Phys., 12: 895-9(July 1966).**

Effective oral therapy for plutonium in rats was obtained with a triethylenetetraminehexacetic acid (TTHA) dose of 3 m-moles/kg administered 1 hr after plutonium citrate injection. Daily oral administration of a 1.5 m-moles/kg dose, initiated 1 hr after plutonium injection and continued for 9 days, was only marginally effective. Measurement of the enhanced excretion of plutonium in the bile during perfusion of different intestinal segments with chelating agents indicated that the agents are absorbed primarily in the jejunum and ileum. Means of promoting absorption and limitations on oral therapy are discussed. (auth)

35214 FLUID AND TISSUE KINETICS OF ^{65}Zn IN THE DOG AND MONKEY. **Johnston, Gerald S.; Gibbons, Robert P.; Schmidt, Joseph D.; Murphy, Gerald P.; Scott, William W. (Walter Reed General Hospital, Washington, D. C.). Invest. Urol., 4: 419-26(Jan. 1966).**

Animal experiments were performed to develop a new method for scintiscanning the prostate gland. The prostate contains a remarkably high concentration of zinc, and is capable of incorporating a dose of radiozinc to a greater degree than any contiguous organ to a greater level than exists in the circulating blood. When ^{65}Zn (100 to 200 μC as $ZnCl_2$ was given intravascularly to dogs, there was an immediate rise in blood concentration of radioactivity, followed by a rapid fall. Urinary concentration of ^{65}Zn was relatively constant over the first 6 hr of observation. Among the tissues measured, the prostate was second only to the liver in its ability to concentrate ^{65}Zn. The testis and epididymis concentrated ^{65}Zn to a relatively poor degree. Castration between 14 and 28 days before ^{65}Zn administration did not alter the concentration of radioactivity in the prostates of otherwise untreated dogs. However, castration did diminish the augmentative effect of testosterone treatment of ^{65}Zn concentration by the prostate. The effect of pilocarpine in decreasing prostate radioactivity was more apparent in castrated dogs. Testosterone propionate treatment increased ^{65}Zn concentration from 120 to 250%. In two monkeys studied in an intact, untreated state, even with allowance for the comparatively small body size of the monkey, their prostates concentrated 15 times as much ^{65}Zn as did the prostates of dogs. It is suggested that the highest theoretical dose of ^{65}Zn would be delivered to the prostate in a hormonally intact preparation with the following regimen: (1) depletion of prostatic zinc by the administration of pilocarpine, (2) intramuscular administration of testosterone daily in 20-mg doses for 6 days, (3) intravenous injection of ^{65}Zn in divided (30–μC) doses on the 2nd, 4th, and 6th days, and (4) scan on 7th day. As seen from the quality of scintiscan, mere increase in ^{65}Zn concentration in the target organ, the prostate, will not ensure a good scan. The physical characteristics of the γ ray emitted from ^{65}Zn are such that obtaining a good scan with currently available scanning instruments is extremely difficult. An isotope that is handled in a manner similar to zinc, but that emits a less energetic γ ray would be preferred. (TCO)

35215 ^{90}Sr PHYTATE AND ^{90}Sr CHLORIDE IN SHEEP AND SWINE AND ROASTING EFFECT ON ^{90}Sr IN MEAT. **Hembry, F. G.; Bell, M. C. (Univ. of Tennessee, Oak Ridge). J. Animal Sci., 25: 199-202(Feb. 1966).**

This study was designed to determine the availability of tracer amounts of ^{90}Sr administered orally as $^{90}SrCl_2$ and

^{90}Sr phytate to sheep and swine, and whether ^{90}Sr concentration is altered during cooking of loin and ham roasts from pigs. Fecal, urine, and plasma analysis revealed no difference in the utilization of ^{90}Sr from the two forms in either sheep or swine, when 1 mC of ^{90}Sr salt was administered orally. Vitamin D added to the diet did not significantly alter ^{90}Sr retention. Roasting significantly decreased the amount of ^{90}Sr in the outer and middle areas of ham meat around the femur, with no effect on ^{90}Sr in the meat immediately adjacent to the femur. Content of ^{90}Sr in pork loin cuts was not altered significantly by roasting. Drippings from the ham and loin roasts contained a small amount of activity. Meat near the bone of both cooked hams and cooked loin cuts contained significantly more ^{90}Sr than meat further away from the bone. Bones averaged 800 times more ^{90}Sr than meat from roasts. Meat, fish, and eggs contribute only about 1.8% of total ^{90}Sr intake through the average diet in the United States. Therefore, meat is only a minor source of ^{90}Sr in the diet. (BBB)

35216 INCORPORATION OF TRITIUM FROM THYMIDINE INTO PROTEINS OF THE MOUSE. Bryant, B. J. (Brookhaven National Lab., Upton, N. Y. Naval Radiological Defense Lab., San Francisco). J. Cell Biol., 29: 29-36(Apr. 1966). (BNL-10327).

Tritium from methyl-^{3}H-thymidine was found to be incorporated into proteins in mice. This incorporation in the mouse as a whole represented between 1 and 10% of the injected tritium. Tritiated water was not an intermediate. Transmethylation reactions are proposed as a means whereby certain amino acids might have acquired the tritium from thymidine at some stage of its catabolism. The initial (2 hr) ratios of DNA to protein tritium activities per milligram of wet tissue ranged from 5 in two tissues of low DNA synthetic activity (pancreas, liver) to 35 to 40 in two tissues of high DNA synthetic activity (spleen, small intestine). Labeled nuclear protein was coincident with labeled DNA in nuclei, where it constituted less than 2.5% of the total tritium. The significance of the findings is discussed. (auth)

35217 PENETRATION OF RADIOACTIVE ISOTOPES THROUGH ENAMEL AND DENTIN. I. DIFFUSION OF ^{22}Na IN FRESH AND COAGULATED DENTAL TISSUES. **Arwill, Tore; Myrberg, Nils; Soeremark, Rune (Univ. of Umea, Sweden). J. Dent. Res., 44: 1299-1303(Nov.-Dec. 1965).**

The diffusion of ^{22}Na in untreated and boiled dental hard tissues was studied in intact, homologous premolars. Boiling, and hence coagulation, had a marked effect on the diffusibility of radiosodium in these tissues, which was reduced. This reduction probably did not depend on a growth of the hydroxyapatite crystallites but seemed to be due to a coagulating effect on the soft tissues of the crown, including the so-called organic stroma of enamel and dentin. The effect of boiling on pure synthetic hydroxyapatite was studied. In this case boiling had no effect on the penetration rate of ^{22}Na. There might, however, be some variation with regard to the packing of the crystallites. The boiling, therefore, is likely to affect the organic stroma of the dental hard tissues, and it is shown that a rather short boiling time, restricted to the crown, which presumably would first act on the enamel, was sufficient to markedly delay the penetration of ^{22}Na in a centrifugal direction. The organic stroma of this tissue thus seems to be sensitive to the coagulating effect of a short boiling period. The reduced permeability of the boiled tissues was thought to be effected through a denaturation of the protein-mucopolysaccharide complex, which in vivo might be at least partly in gel form. (BBB)

35218 A SIMPLE APPARATUS FOR GENERATING AN AIR STREAM CONTAINING A CONSTANT CONCENTRATION OF $^{14}CO_2$. **Goldsworthy, A. (Imperial Coll. of Science and Tech., London). J. Exp. Bot., 17: 147-50(Feb. 1966).**

An apparatus is described which generates an air stream, of constant flow-rate, containing an adjustable concentration of $^{14}CO_2$ which remains constant for any period up to 16 hours. It depends for its operation on the continuous generation of CO_2 from radioactive sodium carbonate. The constant flow-rate was obtained via a capillary leak from a reservoir of air maintained at constant pressure. The constant pressure was produced in the reservoir by pumping air into it but, at the same time, leaking air out against a constant head of water in the aspirator. The flow of air from the reservoir to the next section of the apparatus was limited by flow meter resistance. The $^{14}CO_2$ generator consisted of a motorized syringe which delivered $Na_2\ ^{14}CO_3$ solution at a constant rate into an excess of lactic acid. The lactic acid was purged of the $^{14}CO_2$ generated within it by a closed-circuit pumping system bubbling through it a fine stream of air bubbles. The main flow of $^{14}CO_2$-free air from the constant flow-rate system, described above, was passed into this circuit, and the $^{14}CO_2$-enriched air left at a point further on in the circuit. (TCO)

35219 ISOTOPIC DISCRIMINATION BETWEEN ^{3}H AND ^{14}C IN VITRO DURING ENZYMATIC PHOSPHORYLATION OF LABELED THYMIDINE. **Baugnet-Mahieu, L.; Goutier, R.; Semal, M. (Centre d'Etude de l'Energie Nucleaire, Mol, Belg.). J. Label. Compounds, 2: 77-89 (Jan.-Mar. 1966).**

The phosphorylation of 6-^{3}H-TdR (thymidine) and 2-^{14}C-TdR to TMP, TDP, and TTP by tissue extracts and to TMP by purified kinase preparations was compared. The rate of phosphorylation of 6-^{3}H-TdR is only 0.6 to 0.8 that of 2-^{14}C-TdR. The same isotopic discrimination exists between methyl-labeled thymidines. In mixtures of ^{3}H-TdR and ^{14}C-TdR incubated together with a liver extract, the isotopic ratio is lower in the products than in the substrate. Degradation products of ^{3}H-TdR do not seem to interfere with enzymatic activity. This isotopic discrimination is tentatively ascribed to an isotopic effect of ^{3}H which is mainly detectable at the high substrate/enzyme ratios prevailing in the in vitro incubation conditions. (auth)

35220 EFFECT OF THIOCYANATE ON RADIOCALCIUM UPTAKE DURING POTASSIUM CONTRACTURE OF FROG SARTORIUS MUSCLE. **Bianchi, C. Paul; Bolton, T. C. (Univ. of Pennsylvania, Philadelphia). J. Pharmacol. Exp. Therap., 151: 456-63(Mar. 1966).**

Since SCN^- is the most potent of the lyotropic anions in potentiating muscle twitch and contracture, experiments were performed to determine the effect of SCN^- on radiocalcium uptake during potassium contracture, the effect of external calcium on the uptake and contracture, the location of the radiocalcium uptake, and the change in total muscle calcium content during the contracture. The muscles were equilibrated for 60 min in Ringer's solution, followed by 30 min in 10 mM SCN-Ringer's solution. The control muscle was then placed for 5 min in ^{45}Ca-10 mM SCN-Ringer's solution, and the experimental muscle was placed first for 3 min in ^{45}Ca-10 mM SCN-Ringer's solution and then 2 min in ^{45}Ca-10 mM SCN-Ringer's solution containing 40 mM K^+. A portion of the radiocalcium taken up during such stimulation with K^+ appears to become bound to sites of higher binding affinity than the radiocalcium taken up in the resting state, although the total amount entering is not significantly different. At $(Ca^{++})_0$ of 1.0 mM, stimulation results in a net calcium loss of 0.15 ± 0.02 μmol/g wet weight of muscle. Lowering $(Ca^{++})_0$ by a factor of 10 results in even a greater net loss of calcium (0.26 ± 0.05); the influx is reduced 10-fold and the tension area of the contracture is reduced 3-fold. The data suggest that, in frog fast muscle fibers, sufficient internal calcium is released to cause contraction and that internal reaccumulation of calcium is blocked by SCN^-. (BBB)

35221 STUDIES ON THE EARLY STAGES OF THYROIDAL IODIDE CONCENTRATION AND BINDING IN THE ADULT RAT THYROID. **Williams, E. Dillwyn (Postgraduate Medical School, London); Vickery, Austin L. Jr. Lab. Invest., 14: 1939-45(Nov. 1965).**

The site of the concentration of iodide and of the iodination of protein in the thyroid was studied utilizing a specialized autoradiographic technique on quick-frozen tissue. Sprague-Dawley albino adult male rats were injected with ^{125}I because its low energy conversion electrons (mean en-

ergy 27 kev with a path length of a few microns) allowed more accurate localization than the relatively hard β radiation from ^{131}I (mean energy 187 kev with a tissue path length of up to 2 mm). The isotope was injected in doses ranging from 200 to 1000 μC. In normal rats, about 10% of intravenously injected radioiodide was bound within 30 sec, 50% bound in 5 min, and 90% at 30 min, indicating a relatively greater increase in iodide concentration than organification. In the iodide-deficient animal the proportion of bound iodide was well above control levels at all time intervals studied. The major localization of inorganic iodide was clearly in the colloid compartment both in the normal and propylthiouracil-blocked thyroids. This observation was made as early as 30 sec after ^{125}I injection. Autoradiography revealed that within 30 sec organic iodide was largely concentrated in a ring pattern at the colloid-cell junction of normal thyroids; and after 5 min, the bound radioiodide tended to be diffusely spread through the colloid. In the iodide-deficient rat, there was a more rapid diffusion of organic iodide in the colloid. The observations suggest that the site of binding of iodide closely approximates the colloid-cell interface, perhaps being actually in the microvilli, and that recently concentrated radioiodide is spread diffusely through the colloid at a time when organic radioiodide is still confined to the periphery. (BBB)

35222 INFLUENCE OF U_3O_8 ON THE PREGNANT FEMALE AND THE FETUS. Kurliandskaia, E. B. Mater. Toksikol. Radioakt. Veshchestv., Akad. Med. Nauk SSSR, 96-104(1964). (In Russian).

After oral and intratracheal administration of the practically insoluble U_3O_8 to pregnant rabbits (0.06-1.8 g/kg) and dogs (0.1-0.5 g/kg), uranium could be recovered in the placenta and the organs of the fetus, and also in various organs of the newborn, except the bones. Uranium was recovered in the milk of nursing females which received U_3O_8 during the period of lactation and was also found in urine and in organs of baby rabbits and puppies which had ingested this milk. In experiments on the chronic effects of U_3O_8, a decrease in reproductive capacity and impaired viability of the newborn animals were noted. (BBB)

35223 SPECIES SPECIFIC DIFFERENCES IN THE ABSORPTION AND DISTRIBUTION OF ThO_2. Zedgenidze, G. A.; Amosov, I. S.; Gulyaev, V. A.; Kulikov, V. A. (Inst. of Medical Radiology, Academy of Medical Sciences, USSR). Med. Radiol., 11: No. 6, 57-65(June 1966). (In Russian).

To accomplish a more detailed study of general regularities governing the kinetics of radioisotopes in the organism, studies were made on species-specific absorptions of a colloidal ThO_2 solution (thorotrast) in rabbits, rats, and mice. The observations were extended over a long period of time and implemented with the aid of total roentgenography, microroentgenography, pathomorphological exploration, and electron microscopy. Dynamics of the intravital redistribution of thorium in the cells of the liver, spleen, bone marrow, and intestines are given. Areas of an elevated isotope concentration in certain bones are described. It is demonstrated that, along with general regularities governing the absorption and redistribution of the isotope, there are also some species-specific deviations in the deposition of ThO_2 in the bones, lymph nodes, and kidneys. (auth)

35224 ASSOCIATION OF ALKALI METAL AND ALKALINE EARTH CATIONS WITH SUBCELLULAR PARTICLES PREPARED FROM RENAL CORTEX. Walser, Mackenzie; Nahmod, Victor E. (Johns Hopkins Univ., Baltimore). Mol. Pharmacol., 2: 10-2(Jan. 1966).

In studying the association of cesium, rubidium, strontium, and barium with subcellular fractions, an attempt was made to avoid increasing the amounts of these cations in normal body fluids and tissues. In nine dogs, intravenous priming doses and constant infusions of ^{137}Cs and ^{85}Sr were given for at least two hr. In three dogs, ^{140}Ba-^{140}La plus 1 μmole $BaCl_2$ and ^{86}Rb were given in the same manner, all as chlorides. The amount of carrier given amounted to less than 2 μmole for all isotopes. A differential centrifugation procedure was used to separate homogenized renal cortex into four sediments and four supernatants. For the largest (nuclear) particles, the extent of association of five alkali cations averaged 5.6%, and of four alkaline earths (Mg, Ca, Sr, and Ba) averaged 24%; no selectivity was seen in either group. The second largest (mitochondrial) particles showed pronounced selectivity, the extent of association increasing from 2% to 15% with increasing atomic weight in the first group, and from 19% to 70% in the second. The third (heavy microsomial) fraction showed no selectivity; an average of 1.4% of the alkaline cations and 6.7% of the alkaline earths was associated with these particles. The fourth (light microsomial) fraction showed the following selectivity in order of increasing atomic weight: Li = Na > K < Rb = Cs; Mg > Ca > Sr $\ll$ Ba. Thus the mitochondrial particles preferentially adsorb (or take up during homogenization) larger cations in both groups, while the light microsomial particles show the least binding of cations of intermediate size. The sequence of tissue-to-plasma ratios of alkaline earths was similar to the sequence of their association with the light microsomial particles. For alkali cations, tissue-to-plasma ratios paralleled the extent of their association with the mitochondrial particles. (BBB)

35225 IN VITRO DISTRIBUTION OF AMERICIUM IN HUMAN BLOOD SERUM PROTEINS. Boocock, G.; Popplewell, D. S. (Atomic Weapons Research Establishment, Aldermaston, Eng.). Nature, 210: 1283-4(June 18, 1966).

Distribution of Am in human blood serum proteins was compared with that of Pu by gel-filtration methods. Pu in various protein eluates was determined by measuring the delayed neutron emission following neutron irradiation. ^{241}Am in equal portions was measured by γ-spectrometry. Pu and Am were found predominantly in the fraction containing albumin and transferrin. Attempts to identify eluate Am radioactivity with any particular protein fraction by ion-exchange chromatography failed. Two further experiments on Am distribution showed similar qualitative but dissimilar quantitative behavior. Results indicated that Am in serum is chemically bound to protein, at least initially, and forms protein complexes weaker than those of Pu, and they do not survive the ion-exchange process. Filtration experiments determined that about 90 to 95% of Am and Pu were distributed in the protein fractions with the remainder in the low molecular fraction. Experiments with added citrate ions produced the inverse effects; practically no actinide was found in the protein portions. Citrate appears to be very effective in removing Am and Pu from their serum protein complexes. (P.C.S.)

35226 DISTURBANCES IN PLANT METABOLISM INDUCED BY TREATMENT OF SEEDS WITH RADIOACTIVE SUBSTANCES. Ilina, G. V.; Kuznetsova, N. N.; Rydkii, S. G. (Moscow State Univ.). Nauch. Dokl. Vyssh. Shkoly, Biol. Nauk, No. 1, 92-5(1964). (In Russian).

Studies were made to establish the conditions under which negative effects of ionizing radiation on plants may be counteracted. This was done by first disturbing the metabolism by exposure to radiation, then studying the effect of feeding changes on the disturbance. Wheat seedlings grown from seeds treated with a 15 μC/liter solution containing ^{32}P, growing in a sandy soil, were supplied with various feed solutions, in which the ammonium nitrate content was partially replaced by ammonium sulfate or potassium nitrate; the total amount of phosphorus was also varied and microamounts of boron and manganese were added to some of the solutions. The results indicated that treatment with the radioactive solution caused a sudden decrease in germination and delayed the appearance of shoots, reducing also the weight of the plants. An increase of phosphorus in the feed supply resulted in an increased initial growth; the nitrogen-containing solutions did not exert such an influence. Addition of potassium nitrate increased the weight but the addition of trace elements was ineffective. The original radioactive treatment increased the non-albumen portion of nitrogen; this was counteracted by the phosphorus-containing solutions and even more strongly by those containing potassium nitrate. The tendency of the carbohydrate metabolism toward monosaccharides was also reduced by an increased nitrogen content in the feed solution and by microamounts of boron and manganese. (TTT)

35227 EFFECT OF DISODIUM EDTA ON THE AVAILABILITY OF RADIOISOTOPES OF STRONTIUM, CESIUM, AND SOME OTHER ELEMENTS IN THE SOIL. Kulikov, N. V. Pochvovedenie, No. 6, 79-83(1965). (In Russian).

The effects of disodium salt of ethylenediaminetetraacetic acid (EDTA) on the sorption of micro amounts of Ca-45, Fe-59, Co-60, Sr-90, Yr-91, Zr-95, Ru-106, and Cs-137 by a meadow soil from water solutions was studied. The effect of EDTA on the behavior of Co-60, Sr-90, Ru-106 and Cs-137 under green-house conditions was also studied. It was found that the efficiency of EDTA is determined principally by the stability constants of its compounds with the cations studied. (auth)

35228 INFLUENCE OF DIETARY CALCIUM AND ZINC ON ^{65}Zn METABOLISM IN LAYING HENS AND THEIR PROGENY. Heth, D. A.; Sunde, M. L.; Hoekstra, W. G. (Univ. of Wisconsin, Madison). Poultry Sci., 45: 75-83(Jan. 1966).

Zinc-65 was injected into laying hens receiving diet containing 65 ppM zinc and 2.25% calcium to investigate the possibility of a calcium : zinc interaction existing at sites other than the intestine. During the first 4 weeks postinjection, about one-half of the administered zinc-65 was lost from the hens. Four weeks postinjection the birds were subdivided into 4 groups and dietary calcium and zinc were varied between groups. Lowered zinc (10 ppM compared to 65 ppM) significantly decreased excretory but not egg zinc-65 output. Increased calcium (4.0% compared to 2.25%) did not alter either excretory or egg zinc-65. Neither calcium nor zinc influenced the portion of zinc-65 remaining in the carcass when the hens were sacrificed at 19 weeks postinjection, but each increased the zinc-65 concentration in bones and decreased it in soft tissues. Incubation of eggs laid by zinc-65-injected hens produced consistently healthy chicks only if maternal dietary zinc was adequate. Nearly all egg zinc-65 was subsequently recovered in the chick at hatching. At hatching the chick bones contained a significantly higher concentration of zinc-65 than did soft tissues, indicating the importance of zinc for embryonic bone formation. Supplementary maternal zinc decreased embryo uptake of zinc-65 and decreased the depletion of yolk zinc-65, probably by maintaining higher total zinc concentration in the yolk. Calcium showed no effect on embryo uptake or yolk depletion of zinc-65. Absence of data to indicate otherwise suggests that the major site of the calcium : zinc interaction in chickens, as with rats, is at the intestinal level or with very recently absorbed zinc. (TCO)

35229 INSULIN IMMUNOLOGIC ACTIVITY IN LIVERS AND KIDNEYS OF MICE INJECTED WITH BEEF INSULIN. Beck, Lyle V.; Roberts, Nancy; Blankenbaker, Ronald; King, Christine (Indiana Univ., Bloomington). Proc. Soc. Exp. Biol. Med., 122: 768-74(July 1966).

Mice were injected with a 19 to 1 mixture of unlabeled and ^{125}I-labeled beef insulins and sacrificed 2, 5, 10, or 25 minutes later. Insulin in especially prepared tissue extracts and fractions was estimated by: immunoassay; and ^{125}I count. Using either assay procedure, insulin reached its highest concentration in liver sooner than it did in kidney, was far more highly concentrated by kidney than by liver, showed decrease in tissue concentration in the order plasma > liver > kidney, and was rapidly and highly concentrated in liver particles brought down between 700 and 105,000 g. Insulin added to liver homogenate was not concentrated by these particles. These findings are in accord with the hypotheses that radioiodinated and unlabeled forms of insulin are metabolized in similar manner, and that both forms of insulin are capable of penetrating into liver and kidney cells. (auth)

35230 NEW KIND OF METABOLISM CAGE FOR WORK WITH RADIONUCLIDES. Nigrovic, Vladimir; Mohr, Theo (Kernforschungszentrum, Karlsruhe, Ger.). Strahlentherapie, 130: 314-16(June 1966). (In German).

A new cage design for studying metabolism of radioisotopes in small rodents is described. (P.C.H.)

35231 FEEDING OF IRRADIATED BEEF TO RATS. Blood, Frank R.; Darby, W. J.; Elliott, G. A.; Wright, M. S. (Vanderbilt Univ., Nashville). Toxicol. Appl. Pharmacol., 8: 235-40(Mar. 1966).

The effect of irradiated beef added to the diet of rats was examined to evaluate the wholesomeness of irradiated foods. Beef irradiated with radiation at 2 levels, 2.79×10^6 rad and 5.58×10^6 rad, was stored at room temperature for 4 months to 1 yr without spoilage. Beef was cooked and mixed with a commercial meal to give a diet containing 35% of the solids as beef. Vitamins A, D, and E were mixed with the diet, and 162 weanling Sprague-Dawley rats were fed the diet containing beef irradiated at the two levels. All animals showed a satisfactory growth rate. There was no evidence that reproduction in the rats was impaired due to the feeding of irradiated beef. No occurrence of the hemorrhagic syndrome previously reported was noted at any time. Mean organ weights for male and female rats fed irradiated foods were within normal limits. No consistent pathology related to the feeding of irradiated foods was seen. It is concluded that no adverse effects were demonstrated, as evidenced by growth, hematologic change, food efficiency, reproduction, mortality, or gross and microscopic pathology. The higher incidence of mammary fibroadenomas and adenomas observed here than that reported by other workers was probably a reflection of age and strain differences rather than diet. (BBB)

35232 FEEDING OF IRRADIATED CHICKEN, BEEF, AND PINEAPPLE JAM TO DOGS. Blood, F. R.; Wright, M. S.; Darby, W. J.; Elliott, G. A. (Vanderbilt Univ., Nashville). Toxicol. Appl. Pharmacol., 8: 241-6(Mar. 1966).

In a program to evaluate the wholesomeness or possible deleterious effects of irradiated foods, irradiated chicken, beef, and pineapple jam were fed to dogs for two years. The foods were γ irradiated at 2.79×10^6 rad or 5.58×10^6 rad and stored at room temperature for 3 months to 1 yr. Diets containing 35% solids as cooked chicken and beef were prepared with 65% of commercial meal. To improve the nutrient value of the jam diet, 10% powdered milk and 55% commercial meal were mixed with 35% jam. Beagle dogs were fed 200 g of food twice daily until 6 months of age; then one feeding of 300 to 400 g/day. Supplements containing vitamins A, D, and E were given twice weekly. The dogs on chicken and beef showed a satisfactory increase in weight from the beginning of the experiment. Male animals receiving nonirradiated jam showed a poorer growth response than those on the irradiated material. Hematocrit values were slightly higher for the male animals receiving irradiated food than for those on nonirradiated food; the reverse trend was shown in the female dogs. Hemoglobin values were slightly higher for animals receiving irradiated beef and for females on nonirradiated beef than for males on nonirradiated beef. No explanation for this difference was evident. After the pretreatment period, hematologic values for dogs on chicken and jam were normal and continued so. Variations observed did not appear to be related to irradiated foods in the diet. None of the animals showed proteinuria, but slight glycosuria was observed in four animals on the irradiated chicken. All dogs on jam showed definite glycosuria attributed to the high carbohydrate content of the diet. Litter size was normal, and all animals whelped showed normal weight gain, which indicated that the bitches produced sufficient milk. The histopathologic examination of organs from both male and female dogs receiving irradiated chicken, jam, or beef showed no evidence of any change which could be related to the inclusion of irradiated food in the diet. However, there were four cases of primary lymphocytic thyroiditis in the irradiated diet series, two in animals receiving chicken, one on the beef diet, and one on the jam diet. (BBB)

35233 FEEDING OF IRRADIATED PEACHES AND WHOLE AND PEELED ORANGES TO MONKEYS. Blood, F. R.; Darby, W. J.; Wright, M. S.; Elliott, G. A. (Vanderbilt Univ., Nashville). Toxicol. Appl. Pharmacol., 8: 247-9(Mar. 1966).

Peaches were γ irradiated with 2.79×10^6 rad or 5.58×10^6 rad, and oranges were irradiated at a level of 150,000 or 300,000 Rep with an electron source. Canned irradiated

peaches were stored at room temperature for 3 months to 1 yr. Irradiated oranges were stored under refrigeration for 60-90 days. Diets were prepared by incorporating peaches or whole oranges as 35% of the solids with a ground commercial chow. After about 15 months, monkeys receiving irradiated peaches often failed to consume the entire diet, and appeared to have vitamin C deficiency. This disappeared when ascorbic acid (50 mg daily) was fed. Two male and two female monkeys were placed on each of the diets. Necropsies were performed on all animals and complete tissue studies were made. Variation in the growth rate of females did not appear to bear relation to the type of diet fed. Hemoglobin and packed cell volume values remained uniform throughout the experiment for all animals on the various diets. Values for intraocular pressure measurements varied considerably, but no increase was found in the mean values for animals receiving whole oranges when compared to monkeys on peeled oranges or peaches. The results showed that inclusion of irradiated peaches, whole oranges, or peeled oranges in the diet of monkeys over a two-year period had no effect on the hematologic picture, growth, microscopic pathology, or mortality. (TCO)

35234 SYNTHESIS AND COMPOSITION OF RIBONUCLEIC ACIDS IN SUSPENDED MAMMAL CELLS. Koch, G. (National Inst. of Allergy and Infectious Diseases, Bethesda, Md.); Kubinski, H.; Trams, G. Z. Naturforsch., 21b: 261-6(Mar, 1966). (In German).

Suspended tissue culture cells incorporate ^{32}P within 60 to 90 min, into two high molecular weight RNA fractions, which can be separated by chromatography on methylated serum albumin celite columns. One fraction contains mainly ribosomal precursor RNA, the other ribosomal precursor RNA and cell messenger RNA. Under unfavorable growth conditions, which do not allow cells to multiply, the synthesis of ribosomal precursor RNA is inhibited and high molecular weight RNA accumulates, which resembles cellular DNA in nucleotide composition. The experimental results indicated that the syntheses of ribosomal precursor RNA and of messenger RNA in mammalian cells are independently regulated. (auth)

35235 DISTRIBUTION OF RADIOYTTRIUM AND RADIOACTIVE RARE EARTHS IN MAMMALIAN ORGANISMS. V. METABOLISM INVESTIGATIONS WITH RADIOPROMETHIUM (^{147}Pm) IN MICE. Gensicke, Friedrich (Staatliche Zentrale fuer Strahlenschutz, Berlin). Z. Naturforsch., 21b: 567-73(June 1966). (In German).

The resorption, organ distribution, and elimination of radiopromethium after subcutaneous (s.c.) and intraperitoneal (i.p.) injection in mice were investigated. The resorption was delayed and radiopromethium was preferentially accumulated in the liver and skeleton. The results were compared with those obtained after application of ^{91}Y, ^{144}Ce, and ^{143}Pr. In its accumulation in the skeleton Pm behaved in a similar fashion to ^{91}Y, whereas in the liver it behaved as ^{144}Ce. With the addition of DTPA doses the elimination of $^{147}PmCl_3$ in the urine was significantly accelerated. In addition, the reduction of activity in all the abdominal organs was established. (tr-auth)

35236 DISTRIBUTION OF RADIOYTTRIUM AND RADIOACTIVE RARE EARTHS IN MAMMALIAN ORGANISMS. VI. MICRODISTRIBUTION OF RADIOPROMETHIUM (^{147}Pm) AFTER INTRAVENOUS AND INTRAPERITONEAL APPLICATIONS TO MICE. Hoelzer, Franz; Gensicke, Friedrich (Staatliche Zentrale fuer Strahlenschutz, Berlin). Z. Naturforsch., 21b: 574-80(June 1966). (In German).

The autoradiographic microdistribution of ^{147}Pm in organs in white mice was studied up to 30 days after intravenous (i.v.) and intraperitoneal (i.p.) injection of ^{147}Pm chloride. The highest deposition of ^{147}Pm occurred in the liver, that is, in the Kuppfer and liver cells. It followed the femur with a long-lasting accumulation extensively in the organic bone matrix, especially in the osteoblastic tissue of the perichondrium and in the primary spongiosa and was connected with local activity concentrations in the bone marrow. The common organs, such as the spleen, pancreas, duodenum, kidneys, ovaries, testicles, and lungs, accumulated Pm both after i.v. and i.p. application, partially diffused or in the form of local activity concentrations. The resorption of the activity deposits caused by i.p. injection on the organ occurred during the observation period over its entire surface. A comparison of the results after both types of injections showed that certain variations exist in the deposition of the radioisotopes in the different organs; the microdistribution is, however, similar. (tr-auth)

35237 INFLUENCE OF BIOLOGICAL AND OTHER PARAMETERS ON STRONTIUM TURNOVER IN THE SKELETON. Schmid, A. (Univ., Munich). Zentralbl. Veterinaermed., Reihe B, 12: 552-7(Dec. 1965). (In German).

In continuation of earlier studies on strontium turnover in the skeleton, its relation to various biological and environmental factors was studied in rats and mice. The results showed that the relative ability of the skeleton to absorb strontium falls with increasing age. With continued strontium uptake a state of equilibrium develops in which the spongy bone contains somewhat more strontium than the compact bone. This equilibrium is linearly proportional to the strontium level in the food. The rate of strontium turnover falls with increasing age but with no difference between the sexes. The rate of strontium turnover (K_t) could be expressed for rats by the following equation: $K_t = f(A) = 0.0752 \cdot e^{-0.0184A} + 0.0153$, where A = the age of the animals in days at the time of beginning of strontium feeding. Strontium metabolism studies in mice showed the same features as found in rats. However, the strontium capacity of the mouse skeleton was about 9/10 that of the rat. (BBB)

35238 INFLUENCE OF MANAGEMENT AND FEEDING ON THE CONTAMINATION OF THE FLESH OF CATTLE WITH ^{137}Cs AND METHODS FOR ITS MEASUREMENT. Kreuzer, W. (Univ., Munich). Zentralbl. Veterinaermed., Reihe B, 12: 592-9(Dec, 1965). (In German).

A survey is reported of fallout radionuclides in the muscle of 300 cattle in the Munich area raised under various conditions from May 1963 to August 1964. The γ spectrometric detection of ^{137}Cs contamination of the meat of cattle from Southern Bavaria in 1963-1964 showed, among other things, a close relation between the ^{137}Cs content and the methods of feeding and management. The muscle of grazing cattle was more heavily contaminated during the months of May to October than was the case with housed cattle. Animals in areas where they are normally housed but where they go out to pasture for some weeks in the autumn showed radioactivity levels in the meat as high as those in animals grazing all the year. During the winter, animals fed almost entirely on dried green food or silage showed particularly high ^{137}Cs values. The ^{137}Cs was measured in the meat by spectrometry after trituration. The standard control consisted of a comparable meat sample to which an amount of ^{137}Cs equal to the activity of the unknown was added. For background measurements an aqueous solution of KCl with the same potassium concentration and total amount as the meat sample was used. Following this report, a discussion by several participants is provided on the dietary sources of ^{90}Sr and ^{137}Cs in Germany. (BBB)

35239 INFLUENCE OF ORGANIC COMPOUNDS ON THE MOVEMENT OF STRONTIUM IN SOILS AND ON THE UPTAKE BY PLANTS. Himes, F. L.; Mangaroo, A. 18p. (CONF-651114-2). ORAU, Gmelin, AED-CONF-65-344-1.

From Annual Meeting of the Soil Science Society of America, Columbus, Ohio.

Stability constants for Sr-organic matter products ranged from 1.42 to 14.46. Soils formed under neutral conditions had higher constants than those formed under very acid conditions. The stability constants increased when the clay minerals and other HF soluble materials were removed. The uptake of Sr decreased rapidly as the stability constants for the Sr-organic matter increased from 5 to 9. A phytic acid solution was very effective in leaching Sr from the soil columns. Nitrilotriacetic acid and EDTA were

usually intermediate in efficiency of leaching and other compounds were less effective. (P.C.H.)

Radiation Effects on Biochemicals

See also CHEMISTRY — Radiation Chemistry

Refer also to abstract 35315.

35240 BIOCHEMICAL CHANGES IN IRRADIATED SPORES OF BACILLUS CEREUS. Farkas, J.; Kiss, I. (Central Food Research Inst., Budapest). Acta Microbiol. Acad. Sci. Hung., 12: 15-28(1965).

Radiation effects on dipicolinic acid content of resting Bacillus cereus spores contained in a dense aqueous suspension were investigated. Spectrophotometry and chromatography were applied to the study of substances leaking from bacterial cells after x irradiation with lethal doses. It was established that the pseudogermination observable in the resting spores after irradiation with high doses is correlated to the increased permeability of the cell wall. It appears that much higher doses are required to damage the cytoplasm membrane than to disorganize the processes inducing cell division. The substances leaking from the spore as a result of irradiation resemble those characterizing the exudate of physiological germination. (auth)

35241 FORMATION OF UNPAIRED ELECTRONS ON SULFUR ATOMS IN IRRADIATED DRY PROTEINS AS STUDIED BY ELECTRON SPIN RESONANCE. Ormerod, M. G.; Singh, B. B. (Royal Military Coll. of Science, Shrivenham, Eng.). Biochim. Biophys. Acta, 120: 413-26(July 13, 1966).

From a study of proteins containing cystine residues, it was concluded that during high-energy irradiation electrons are trapped on the cystine residues. The resultant cystine anion reacts to give the $-CH_2-S^{\cdot}$ radical previously observed by others. These reactions are affected by freeze-drying the proteins from solutions of different pH's and can be prevented by additives which scavenge electrons. If the protein contains cysteine residues, $-CH_2-S^{\cdot}$ radicals are formed also by the migration of radicals on to the sulfhydryl group of the cysteine. These results were supported by a study of the radical reactions in irradiated oxidized and reduced glutathione. (auth)

35242 ACETYL- AND BUTYRYLCHOLINESTERASE ACTIVITY OF SELECTED BRAIN AREAS IN DEVELOPING RATS AFTER NEONATAL X-IRRADIATION. Maletta, Gabe J.; Timiras, Paola S. (Univ. of California, Berkeley). J. Neurochem., 13: 75-84(Feb. 1966).

Acetylcholinesterase and butyrylcholinesterase activities in sensorimotor cortex, hypothalamus, cerebellum, and brain stem were compared in rats after neonatal whole-body exposure to 450 R x radiation. Enzyme activities were measured on day 10, when brain is still immature; day 24, when it has reached functional and morphological maturity; and day 64, after sexual maturation. In controls acetylcholinesterase and butyrylcholinesterase activities increased with age in all areas, especially between 10 and 24 days. At all ages acetylcholinesterase activity was highest in the brain stem, following in decreasing order by the hypothalamus, cerebellum, and sensorimotor cortex. Butyrylcholinesterase activity was higher in subcortical than in cortical areas. In irradiated rats, acetylcholinesterase activity was significantly decreased in the ontogenetically newer structures at 10, but not at 64 days; in the hypothalamus, it remained normal at 10 days but was significantly decreased at 24 and 64 days. Butyrylcholinesterase activity was significantly decreased in some areas 1 week after radiation but returned to normal at 24 days. Total esterase activity in whole blood was significantly decreased at 10 days in irradiated rats but returned to control levels by the end of the experiment. The greatest postirradiation decline in acetylcholinesterase activity (60% below controls) did not result in spontaneous gross behavior alterations, but may be related to disturbances in functional brain maturation evidenced by specific tests. On the basis of acetycholine as a central neurotransmitter, these data suggest that irradiation alters acetycholine/acetylcholinesterase ratios and thereby cholinergic synaptic transmission. (BBB)

35243 IMMUNOELECTROPHORETIC EXAMINATIONS OF THE SERUM PROTEIN CHANGES INDUCED BY RADIATION. Petranyi, Gyozo; Benczur, Miklos (MTA Orvos-Radiologiai Kutatocsoport, Budapest). Magyar Radiol., 17: 374-8(Dec. 1965). (In Hungarian).

Experiments were conducted on 8-week-old and 8-month-old rats to determine the serum protein changes after x irradiation with whole-body doses of 600 R and 1500 R, at 200 kv and 41.5 R/min. Reference antiserum was obtained in the usual fashion; the rabbits were given 2-ml doses of rat serum at 10-day intervals to produce immune serum. This serum was used when it showed a precipitation titer of 1:10,000. Immunoelectrophoresis was conducted with a modified Scheidegger micromethod (1.5% agar, 8.6 pH Na barbiturate-acetate buffer, 150 min, 6.4 v/cm). Serum from the 8-month-old, 600-R irradiated animals was examined on the 1, 3, 6, 12, 14, 22, and 28 days postirradiation. The first arc (fastest fraction) showed a decrease; however, this could not be found in every animal. On the 6th day a complete absence of this arc was noted; it reappeared on the 22nd day in some animals. In the 8-month-old, 1500-R irradiated animals the first arc was difficult to discern, or was nonexistent. These animals died on the 4th day. The β-globulin arcs were decreased. The 8-week-old, 600-R irradiated animals showed no significant differences from the first group in the first two days, but slight changes were noted on the third day and on the 7th day well-defined differences were noted. It was found in some instances that the albumin became less convex and moved away from the antiserum trough. The γ-globulin arc appeared shortened. These results indicate that changes occur in the serum protein due to irradiation, which can be shown quantitatively by paper electrophoresis and qualitatively by immunoelectrophoresis. (BBB)

35244 RADIOIMMUNOASSAY FOR HUMAN LUTEINIZING HORMONE. Odell, William D.; Ross, Griff T.; Rayford, Phillip L. (National Cancer Inst., Bethesda, Md.). Metab. Clin. Exp., 15: 287-9(Apr. 1966).

A new method for radioimmunoassay of human luteinizing hormone (HLH) is reported. Antisera to both human chorionic gonadotropin and HLH were prepared in rabbits. One μg of purified HLH was radioiodinated to sp. act. of 100–500 μC/μg by the method of Greenwood, et al. (Biochem. J., 89: 114(1963)). Separation of antibody-bound LH-^{131}I and free LH-^{131}I was accomplished by the double antibody technic. In performance of the assay, the following reactants were added to test tubes in the order indicated. Final volume of the reaction mixture was 1 ml. (1) Buffer containing 0.01M phosphate, 0.15M NaCl, 2.5% normal rabbit serum, and 0.1% sodium azide in a volume sufficient to make a final volume of 1 ml. (2) 0.1 ml. of 0.1M EDTA dissolved in this buffer. (3) 0.005 to 0.2 ml of serum or plasma to be assayed. (4) 0.1 ml of HLH-^{131}I containing 0.1 μg of HLH-^{131}I. (5) 0.1 ml of the antisera to HLH suitably diluted so that 50 to 75% is antibody-bound in tubes containing no unlabeled HLH. After 5 days' incubation at 4°C, an excess of sheep antirabbit γ-globulin was added to every tube. After 24-hr further incubation, the tubes were centrifuged at 500 g for 20 min and the supernatant removed by continuous suction. Tubes were counted in an automatic gamma spectrometer and results expressed directly as per cent of counts in tubes containing no unlabeled hormone in the standard dose response curve. The entire dose response curve is encompassed from 0.05 to 10 μg of the purified preparation of HLH. The dose response curve of serum from a postmenopausal woman demonstrates that endogenous gonadotropin behaves similarly to the standard. (BBB)

35245 DNA-STRAND SCISSION AND LOSS OF VIABILITY AFTER X IRRADIATION OF NORMAL AND SENSITIZED BACTERIAL CELLS. Kaplan, Henry S.

(Stanford Univ., Palo Alto, Calif.). Proc. Nat. Acad. Sci. U. S., 55: 1442-6(June 1966).

Irradiation of E. coli induced a decrease in sedimentation rate of alkali-denatured and native DNA, attributable to single- and double-strand scission, respectively. Single-strand scissions were repaired during reincubation of the irradiated cells, whereas double-strand scissions were not. 5-Bromodeoxyuridine (BUdR) increased the yield of double-strand scissions to the same extent (threefold) as it increased radiation lethality. It was concluded that double-strand scissions in DNA are the radiochemical lesions principally responsible for the lethal effect of ionizing radiation in E. coli. However, single-strand scissions are probably important in radiosensitive mutants lacking the repair system, and perhaps also in cells grown under conditions in which repair is inhibited. (auth)

35246 REGULATION OF VIRUS-INDUCED DEOXYRIBONUCLEASES. McAuslan, B. R.; Kates, J. R. (Princeton Univ., N. J.). Proc. Nat. Acad. Sci. U. S., 55: 1581-7(June 1966).

The regulation of virus-induced alkaline and acid DNases were compared with that of thymidine kinase. The materials used were aminopterin, 5-fluorodeoxyuridine, 5-bromodeoxyuridine, uridine, and ultraviolet radiation. From the results it was concluded that the control of three poxvirus-induced enzymes involves three different mechanisms. (P.C.H.)

35247 ELECTRON SPIN RESONANCES IN IRRADIATED FRUIT. Romani, R. J. (Univ. of California, Davis). Contract AT(11-1)-34. Radiat. Bot., 6: 371-2(Aug. 1966).

Direct evidence is presented for the prolonged existence of ESR signals in several fruit tissues some of which contain as much as 80% water. Avocados, bananas, pears, and unthawed strawberries, containing some sugar, were irradiated at 0 to 5°C with a dose rate of 350 krad/hr using a ^{60}Co source. The obvious increase in signal height with radiation dose, plus signal decay with post irradiation time firmly established the presence of ESR signals in irradiated fruit tissues. (P.C.H.)

35248 INVESTIGATIONS ON COMBINATION INJURIES. PART 5. THE SECRETION OF TAURINE AND UREA IN WHITE MICE AFTER A COMBINATION OF RADIATION BURDENING AND SKIN WOUNDS. Streffer, Christian; Messerschmidt, Otfried (Univ., Freiburg i. B.). Strahlentherapie, 130: 285-95(June 1966). (In German).

The excretion of taurine and urea in the urine was investigated in white mice by means of column chromatography after irradiation and an open skin wound. The excretion of both of these metabolites was increased 1 to 2 days after whole-body irradiation with 300 or 510 R. A similar effect was observed 1 to 4 days after an open skin wound had been inflicted. Combination of irradiation with 300 R and an open skin wound 2 days after irradiation revealed an additive behavior for the excretion of taurine and urea. When irradiated with 510 R, the excretion considerably exceeded the anticipated value obtained by adding both results. (auth)

35249 EFFECTS OF CYSTEINE ON THE ACTIVITY OF ORGAN DESOXYRIBONUCLEASES AFTER WHOLE-BODY IRRADIATION OF RATS. Rathgen, Guenther H. (Univ., Mainz). Strahlentherapie, 130: 305-13(June 1966). (In German).

A distinct activity increase of 7,4- and 5,2-deoxyribonuclease was found in liver and spleen of rats 60 min after whole body irradiation with 800 R. The enzyme activities attained their maximal values 24 hours after irradiation and were observed to decrease 48 hours after irradiation. Similar changes were observed with the 7,4-deoxyribonuclease in the mucous membrane of the small intestine. However, in this organ the activity of the 5,2-deoxyribonuclease decreased during the first 60 min. A similar pattern, but not as extensive, was observed with deoxyribonuclease after the injection of 140 mg of cysteine per kg bodyweight prior to irradiation. (auth)

35250 EFFECT OF PRESOWING IRRADIATION ON SEED SPROUTING. Sukach, K. I. Tr. Kishinevsk. Sel'skokhoz. Inst., 37: 78-83(1964). (In Russian).

Treatment of dry corn seeds with ionizing radiation in doses of 1600 and 6000 R (160 R/min) had no effect on the carbohydrate and protein contents in the grain. Irradiation of 12-hr old sprouts with doses of 1600 R had a favorable effect on starch hydrolysis and sugar accumulation. A dose of 6000 R inhibited seed sprouting: starch content in this case was the highest (65.3 against 61.4% at a dose of 1600 R), and sugar content was least (2.97 and 3.59%). The difference between sugar and starch contents increased with increase in the age of sprouts to 3 days. Protein splitting and amino acid accumulation took place more intensely in the case of irradiation with 1600 R; at such a dose protein content was 0.6% less, and nonprotein N was 0.1% higher than in the control. (auth)

35251 MOLECULAR MECHANISMS UNDERLYING RADIATION-INDUCED CYTOGENETIC INJURIES. Ivannik, B. P.; Klipson, N. A.; Mamedova, T. G.; Ryabchenko, N. I.; Sklobovskaya, M. V.; Yaskevich, A. G. (Inst. of Medical Radiology, Obninsk, USSR). Vest. Akad. Med. Nauk SSSR, No. 9, 18-22(1965). (In Russian).

The nature of injuries produced by different forms of free radicals and by radiation at the cellular and molecular levels was investigated and the local injuries to DNA and DPN are described. Damage to the basic matrix structure of the cell nucleus following ionizing radiation is secondary to the cell's direct absorption of radiant energy. This damage cannot be duplicated by the action of free radicals or ultraviolet radiation. There is a difference between the primary physicochemical changes in DNA and DPN arising from ionizing radiation, free radicals, or from ultraviolet rays. (A.T.D.)

35252 AMINO ACID COMPOSITION OF GLOBULIN IN THE BLOOD SERUM OF IRRADIATED AND NONIRRADIATED DOGS. Giudinovskyh, A. V. Vop. Med. Khim., 11: No. 3, 53-7(1965). (In Russian).

On the basis of previous observations of an elevation of the serum α_3-globulin fraction during radiation sickness, an investigation was made of possible changes in the chemical composition of this serum protein fraction in three irradiated dogs. Blood was removed from two of the dogs prior to irradiation with a dose of 700 R. In one of these dogs irradiation was carried out one month and in the other four months after blood loss. Amino acid composition of the α_3-globulin fraction was carried out 16 days and 10 days, respectively, in the two dogs by use of the Moore and Stein chromatographic method. No difference was noted in the amino acid composition between irradiated and nonirradiated dogs. However, in comparison with haptoglobin fractions some differences were noted in contents of aspartic acid, glutamic acid, glycine, valine, leucine, tyrosine, phenylalanine, and arginine. (BBB)

Radiation Effects on Tissues

35253 INFLUENCE OF WHOLE-BODY X IRRADIATION ON THE IN VITRO INCORPORATION OF GLYCINE-1-^{14}C INTO PROTEINS AND ACETATE-1-^{14}C INTO CO_2, PROTEINS, AND LIPIDS AS WELL AS ON THE GLYCOGEN CONTENT IN MATERNAL AND FETAL RAT LIVER. Goetze, T.; Goetze, E. (Friedrich-Schiller-Univ., Jena, Ger.). Acta Biol. Med. Ger., 15: 353-64(1965). (In German).

Pregnant female rats of the Wistar strain were subjected to 400- or 800-R whole-body doses of 200-kv x rays on the 17th to 22nd day of gestation. The incorporation of 1-^{14}C-glycine into fetal liver sections of animals irradiated with 800 R on the 17th day was lowered from the 18th to 22nd day, while no significant differences from controls were found in the maternal liver. Irradiation with 400 R increased the rate of incorporation in the fetal liver from the 19th day, corresponding to the regeneration of erythropoiesis. The animals examined at 48 hr after irradiation with 800 R from the 18th to 22nd day also showed reduced rate of incorporation in the fetal liver sections. No uptake was seen, however, in the maternal liver. In animals examined at the 21st day of pregnancy 10 min to 96 hr after

irradiation with 800 R, reduced glycine incorporation into fetal liver proteins was found after 8 to 96 hours; none, however, was incorporated into maternal liver protein. Weight determinations of the mothers revealed reductions on 5 to 15% following irradiation with 800 R; after 400 R the increase in weight, which was not present in all animals, did not correspond to the normal growth rate. The incorporation of 1-^{14}C-acetate into CO_2, proteins, and lipids was lowered on the 19th day of pregnancy after irradiation with 800 R at 4 to 48 hours before the examination of maternal liver, but in fetal liver into CO_2 and the protein fraction only. The changes in the maternal liver were also found after sham irradiation. No significant changes occurred on the 22nd day. Sham irradiation increased incorporation in all fractions investigated in the fetal liver. The prenatal glycogen increase was not affected by irradiation. (BBB)

35254 INCREASE OF ANTIBODY TITERS BY X RAYS. Loiseleur, J. (Institut du Radium, Paris). Ann. Inst. Pasteur, 109: Suppl., 30-8(Nov. 1965). (In French).

Results of experiments conducted in rabbits indicated that under certain conditions x irradiation is capable of augmenting serum antibody levels. Three conditions are important: (1) the time of irradiation in relation to antigen stimulation, (2) the body region irradiated, and (3) the dose of irradiation. The increased serum antibody titer is a direct result of more rapid antibody synthesis, which is manifested immediately after the reinjection of antigen. Thus in rabbits irradiated with 50-R, whole-body doses of x rays, titers of 200 to 600 of antibody was reached after a second injection of antigen (ovalbumin), compared to titers of < 100 in nonirradiated controls. Irradiation was most effective when given after one to three priming doses of antigens. Doses of x rays in the range 20 to 60 R were effective: >80 R depressed antibody synthesis. Strong localized irradiation was effective as well as weak whole-body irradiation. Flocculating antibody titers were increased 2- to 3-fold in rabbits receiving 100- to 400-R doses on both front paws, in comparison with controls inoculated with ovalbumin. As an explanation of radiation stimulation of antibody synthesis, it is proposed that radiolysis of nucleoprotein-antibody complexes provides substances which enhances the response of lymphoid tissue. (BBB)

35255 EXTENSIVE POLYNUCLEATE GIANT CELL FORMATION AFTER X IRRADIATION OR ADDITION OF COLCHICINE IN SV_{40}-TRANSFORMED SYRIAN HAMSTER CELLS. Enders, J. F.; Gunalp, A.; Gresser, I.; Diamandopoulos, G. Th.; Shein, H. M. (Children's Hospital Medical Center, Boston). Arch. Gesam. Virusforsch., 17: 347-73(1965).

Polynucleate giant cells and giant cells with multilobed nuclei appear in cultures of Simian virus 40 (SV_{40})-transformed Syrian hamster kidney cells. In experiments in which SV_{40}-transformed hamster kidney cells were employed as feeder layers, it was noted that after x irradiation the proportion of polynucleate cells was strikingly increased. Experiments were therefore undertaken to determine whether this phenomenon, referred to as PPGF (postirradiation polynucleate giant cell formation), was conditioned by the particular virus-cell association existing in this system or whether it occurred more generally, and also to elucidate the responsible factors. Results showed that x irradiation of Syrian hamster cells transformed by SV_{40} which exhibited evidence of the presence of the viral genome was consistently followed by extensive polynucleate giant cell formation. With the possible exception of cells derived from an adenovirus 12-induced tumor, this phenomenon was not observed in other Syrian hamster cell systems, i.e., lines of oncogenic cells originally exposed to SV_{40} virus but in which no evidence of the viral genome could be subsequently demonstrated; cells transformed by polyoma virus; a line of oncogenic cells not associated with virus; continuous lines; and primary cultures of normal cells. Extensive postirradiation polynucleate giant cell formation did not occur in SV_{40}-transformed lines of human cells; in primary cultures of human cells of various tissue origin; or in lines of cells derived from human malignant tumors. Treatment with colchicine of SV_{40}-transformed hamster and human cells induced extensive polynucleate giant cell formation only in hamster cell systems. Therefore the effect of colchicine appears to parallel that of irradiation. The discussion offers various possible mechanisms to account for the phenomenon of postirradiation and colchicine-induced polynucleate giant cell formation in hamster cells bearing the SV_{40} genome. (BBB)

35256 ULTRAVIOLET INDUCED MUTANTS OF BLUE-GREEN ALGAE. I. ANABAENA CYCADEAE REINKE. Singh, R. N.; Singh, H. N. (Banaras Hindu Univ., Varanasi, India). Arch. Mikrobiol., 48: 109-17(Apr. 29, 1964).

In this nitrogen-fixing blue-green alga, auxotropic as well as pigment deficient mutants were isolated for the first time by uv treatment. Seven different screening media including the basal one were used during the course of this investigation. In screening tests for nutritional and pigment-deficient mutants, after 10 min of uv treatment a single colony appeared only on AA-3 medium in light while on other media no colony appeared even after two months. The surviving colony was designated as 10 M_1^L and served as the parent strain for all further treatment. All the four mutants described appeared to be stable. They were identified on the basis of their pigment composition, nutritional requirements photoautotrophic growth, and reaction to light. Strain 10 M_1^L is a nonnitrogen-fixing mutant, as indicated by its inability to grow on basal medium (AA) deficient in conbined nitrogen. Strain 10 M_1^L/10 M_2^D is apochlorotic, and grows very slowly on medium AA-3 both in light and dark but comparatively better under the latter condition. Strain 10 M_1^L/10 M_2^D is deficient in β-carotenoid, photosensitive, and able to grow in dark only on AA-3 medium, while strain 10 M_1^L/10 M_3^D is a photoheterotropic nitrogen-fixer. (BBB)

35257 ULTRAVIOLET INDUCED MUTANTS OF BLUE-GREEN ALGAE. II. ANABAENA DOLIOLUM BHARADWAJA. Singh, R. N.; Singh, H. N. (Banaras Hindu Univ., Varanasi, India). Arch. Mikrobiol., 48: 118-21(Apr. 29, 1964).

The isolation of a glucose-requiring, nitrogen-fixing mutant and a mutant strain with lytic properties from Anabaena diliolum is reported. The mutant strains were stable through a number of transfers. Four different media were used to screen mutants. The material was grown in the medium AA and after irradiation screened on AA-2. Surviving colonies were brought back to the basal as well as other supplemented media for the detection of mutants if any. On mutant strain, 5 M_{16} (isolate No. 16 of 5-min uv treatment on AA-2 medium) does not grow on basal medium, but can grow, if supplemented with glucose on AA-3 medium, slowly. It is characterized as glucose-requiring, nitrogen-fixing mutant. Similarly, when it is tested on AA-1 and AA-4, growth rate observed was comparatively better but not to that extent as observed on AA-2. There is invariably an interpolation of lag period observed during its growth cycle on AA-1, AA-3 and AA-4 but not on AA-2. All attempts to grow the parent as well as mutant strains in dark on various supplemented media failed, which is probably indicative of its obligatory phototrophic nature. The second mutant strain, L_Y-5 M_8/5 M_{12} (isolate No. 12 of second 5-min uv treatment with lytic property from the isolate No. 8 of first 5 min uv treatment on AA-2 medium), grows transiently in all the media tried, i.e., AA-1, AA-2, AA-3, and AA-4. But after a certain period, characteristic for each medium, massive lysis ensures. In AA-2 it occurs on 14th day, while on AA-1, AA-3 and AA-4 on 22nd, 18th and 16th days respectively. In the beginning the material starts gradual fading and finally the entire contents of cells eject into the medium leaving the cell walls. (BBB)

35258 THE EFFECT OF LASER RADIATION ON THE RETINAL VASCULATURE: ANIMAL AND CLINICAL STUDIES. L'Esperance, Francis A. Jr. (Columbia-Presbyterian Medical Center, New York). Arch. Ophthalmol. (Columbia), 74: 752-9(Dec. 1965).

General effects of laser radiation upon the various components of the retinal vascular system were examined and the histologic response of the vascular and perivascular tissues was discussed with regard to their absorption, transmission, and scattering potential. The effect of the laser beam on retinal microaneurysms, neovascularization, and angiomata was investigated. A significant difference in the response of monkey eyes and of rabbit eyes to laser irradiation was seen. Despite intensive laser irradiation, the retinal blood vessels of rabbits appeared unaffected. Changes in eyes of monkeys consisted of intraretinal vapor bubble cleavage planes, destruction of the outer nuclear and rod-cone layers, moderate proliferation of the pigment epithelium and choroidal pigment, and occasional areas of rupture of the choriocapillaris. Vascular changes in the monkey eyes exposed to laser radiation for a longer period of time consisted of intramural pigment migration and proliferation, a decrease in the mural cell population, and an increase in the thickness of the vessel wall with disruption of the normal architecture. The retinal vessels were most affected, not from the heat produced by the irradiated hemoglobin, but by the heat gradient created in nearby absorbent pigment cells. Clinically, microaneurysms responded excellently to laser irradiation and were obliterated without difficulty. The proximity of the microaneurysm to the pigment epithelium probably accounts for most of the coagulation changes that occur. Whether these coagulations affect the long-term course of diabetic retinopathy is not known. No serious vitreal hemorrhages were noted during the one-year study. (BBB)

35259 STIMULATION OF DPN METABOLIC PROCESSES IN ASCITES TUMOR BY LOW-DOSE X RADIATION AND TRENIMON. **Rueter, J.; Vachek, H.; Oldekop, M.; Wueppen, I.; Hilz, H. (Univ., Hamburg). Biochem. Z., 344: 153-66(1966). (In German).**

Ehrlich ascites tumor cells showed a dose-dependent inhibition of growth after x irradiation with doses of 500 to 1000 R. Yoshida sarcoma cells x irradiated with 500 R had only 7% of the proliferative capacity of normal cells in rats. When Ehrlich ascites tumor cells were irradiated with these low x-ray doses and reimplanted into mice, they showed a dose-dependent increase in the capacity to incorporate nicotinic acid into DPN and an increase in DPNase activity. The same reaction could be achieved by treatment of the cells with small concentrations of the ethyleneimine derivative Trenimon. In Yoshida sarcoma cells, these changes occurred at lower x-ray doses, corresponding to their greater radiation sensitivity. The stimulation of DPN turnover, which may be inferred from these experiments, grossly paralleled the inhibition of cell proliferation. Moribund cells were characterized by decreased DPN synthesis and content. (BBB)

35260 EFFECTS OF DIMETHYLSULFOXIDE ON PRODUCTIVITY OF X-IRRADIATED FLOUR BEETLES. **Erdman, Howard E. (Battelle Memorial Inst., Richland, Wash.). Biol. Bull., 130: 157-69(Apr. 1966). (BNWL-SA-307).**

Sexually mature virgin female flour beetles, Tribolium castaneum (Herbst), mutant: sooty, were treated with dimenthylsulfoxide (DMSO) and x rayed. Fecundity, fertility, and viability were measured. DMSO gave no radiation protection to female germ cells. Food containing 4.6% DMSO was unpalatable. Photomicrographs of ovarioles showed that sterility resulted because of oosorption. DMSO might be economically important in protecting stored products from insects. (auth)

35261 KINETIC ASPECTS OF THE RESTORATION OF IRRADIATED CELLS. **Korogodin, V. I. (Institut de Radiologie Medicale, Obninsk, USSR). Biol. Med. (Paris), 54: 402-14(July-Aug. 1965). (In French).**

The kinetics of cell restoration after irradiation with γ rays or α particles was studied in the yeast Saccharomyces vini. Six models for cell restoration are described and compared with experimental data. The results showed that restoration is never complete. The restoration constant remains stable during the entire restoration time and does not depend on the effective dose. This indicated that restoration obeys the simple statistical law and that it is controlled by certain elements of cellular structure present in large numbers. These cellular structure elements undergo slight lesions as a result of irradiation. (J.S.R.)

35262 REGENERATION PROCESSES AFTER IRRADIATION AND THEIR RELATIONS WITH THE PROBLEM OF RADIOLESIONS. **Svyatukhin, M. V.; Sorokina, Yu. D. (Institut d'Oncologie Experimentale et Clinique, Moscow). Biol. Med. (Paris), 54: 440-54(July-Aug. 1965). (In French).**

Observations on regeneration processes in the thymus of mice exposed to whole-body x irradiation are reported. The strain C 57 B1 was used. The results showed that the destruction of lymphoid cells in the thymus in rats exposed to whole-body irradiation is followed by a restoration process that is more complete and rapid when the lesions are caused by low irradiation doses. After a dose of 150 R the regeneration speed of lymphoid cells is considerably faster than that of lymphoma growth induced by radiations. After a dose of 550 R, the restoration speed is comparable to or slightly superior to the speed of lymphoma growth. After fractionated irradiation with a total dose of 800 R the regeneration is slower and lasts one and a half to two months after the last week of irradiation. The association of the whole-body irradiation with urethane narcosis not only increases the importance of the destructive modifications in the thymus but also retards the regeneration processes. The slowness of the mitotic coefficient increase was particularly significant in this respect. (J.S.R.)

35263 DEPRESSION AND RESTORATION OF THE REGENERATIVE POWER OF PERIPHERAL NERVES AFTER APPLICATION OF X RAYS. **Strelin, G. S.; Evsyukov, V. I. (Central Inst. of Roentgenology, Leningrad). Biol. Med. (Paris), 54: 466-76(July-Aug. 1965). (In French).**

The restoration of lesions in the irradiated nerve in rats was studied by sectioning the nerves immediately and at various periods of time after irradiation. The results showed that whole-body irradiation of the rat at a dose of 600 R does not inhibit regeneration of the sectioned sciatic nerve. Local irradiation of the paw is equally inefficient in this respect. Local irradiation of the paw at doses of 1500 and 3000 R provokes a statistically significant inhibition of nerve regeneration. This inhibition is durable as the nerve is little adapted to repair its radiolesions. Irradiation of the bone marrow corresponding to the nerves of the posterior extremities with 3000 R does not inhibit regeneration of the nerve section. The fibers of irradiated nerve cells therefore do not lose their regeneration faculty. These results lead to the assumption that inhibition of nerve regeneration that is established immediately after irradiation is determined principally by shocks to the conjunctive tissue and the Schwann syncytium and not by axons. (P.C.H.)

35264 DISCUSSION ON THE GENETIC CONTROL OF THE SENSITIVITY OF MICROORGANISMS TO THE LETHAL ACTION OF RADIATIONS. **Marcovich, H. (Institut Pasteur, Paris). Biol. Med. (Paris), 54: 477-84(July-Aug. 1965). (In French).**

Recent studies on the effects of genetic factors on the sensitivity of microorganisms to the lethal action of radiations are reviewed. Examples are given of representative studies on bacteriophages, bacteria, and yeast. (J.S.R.)

35265 REGENERATION OF NERVES AND MENINGEAL CENTERS. **Vedrenne, Cl. (Faculte de Medecine, Paris). Biol. Med. (Paris), 54: 485-92(July-Aug. 1965). (In French).**

Regeneration of the meningeal and nervous centers were studied in dogs, cats, and rabbits after intracerebral implantation of ^{198}Au and ^{90}Y. The different lesional aspects given by gold and yttrium are summarized. ^{90}Y caused very localized destructive lesions, but ^{198}Au, a mixed β and γ emitter, caused more complex lesions. Between the total central necrotic zone and the healthy parenchyma, there was a very extended transition zone with marked histological alterations. The animals were sacrificed at intervals from a few hours after implantation up to 18 months. The regeneration phenomona after implantation

of ^{90}Y were relatively simple, but evolution of the lesional process after implantation of ^{198}Au appeared complex. These processes are outlined. In the case of ^{198}Au implantation delayed lesions were observed essentially at the level of the white substance and appeared to have a relation with vascular lesions. The significance of these results is discussed briefly. (J.S.R.)

35266 EFFECT OF INCREASED NATURAL AND ARTIFICIAL ULTRAVIOLET RADIATION ON THE CONTENT OF PLASTID PIGMENTS IN PLANT LEAVES. Shaidurov, V. S.; Voskanyan, V. E.; Narinyan, S. G.; Della-Rossa, R. G. (Botanical Inst., Academy of Sciences, Armenian SSR). Biol. Zh. Arm., 19: No. 3, 14-18(Mar. 1966). (In Russian).

Radishes were grown at an altitude of 3225 meters above sea level on limed and unlimed soils with a covering of glass, which absorbs ultraviolet radiation, or polyethylene, which transmits a high percentage of the ultraviolet radiation. Uncovered plants served as controls. Campanula tridenta was also given artificial ultraviolet radiation from a lamp in doses of 9.4, 19.1, 28.6, 38.2 and 57.2 watt/cm^2. The pigments were separated by paper chromatography, and the results showed that the radish leaves grown under glass had a higher content of pigments than the radish leaves grown under polyethylene film. Soil liming increased the pigment content of plant leaves grown under glass, polyethylene, or in the open. The open plants showed the poorest yield. Artificial uv radiation increased the content of all pigments. Plants with a high chlorophyll content also showed a relatively high carotenoid content. (TTT)

35267 PERCEPTION OF IONIZING RADIATION. A STUDY OF BEHAVIORAL AND ELECTRICAL RESPONSES TO VERY LOW DOSES OF X RAY. Garcia, John (Massachusetts General Hospital, Boston); Buchwald, Nathaniel A. Bol. Inst. Estud. Med. Biol. (Mex.), 21: 391-405(Dec. 1963).

Data are provided showing that, contrary to general belief, the central nervous system (CNS) is highly sensitive to ionizing radiation. To demonstrate x-ray detection, rats were tested and trained in a standard Skinner-type conditioning apparatus. X ray was employed as a conditioned stimulus with shock serving as the unconditioned stimulus (US). Preliminary training consisted of pairing 10 sec of x-ray exposure (.2R/sec) with intermittent shock imposed during the last 8 sec. This treatment was continued at intervals of 1 to 3 min for 10 exposures and again in 2 or 3 days until 40 conditioning exposures had been administered. Many animals attempted to escape the experimental chamber at the onset of irradiation after a few pairings of x-ray and shock. This indicated that the x-ray was serving as a detectable stimulus signalling the subsequent shock. Next, testing was conducted by exposing the animal to brief periods of x ray while it was engaged in pressing the lever for food. In some cases this exposure elicited an immediate arrest in bar-pressing behavior. The animals had learned to detect the onset of x irradiation and to avoid shock by cessation of pressing. In other rats the threshold for the detection of x ray was determined using the conditioned suppression technique. The results showed that the probability of detection of radiation is a function of intensity (dose rate). At higher dose levels (0.200 and 0.050 R/sec) increase in detection with degree of training was clearly seen. At 0.016 R/sec only equivocal indication of x-ray detection was noted. Results for ophthalmectomized and visually intact rats were similar. Retinal detection could not be responsible for the effects observed. It was observed that animals tended to go to sleep during sham exposures and to remain awake during actual irradiation. EEG's were made during sleeping and waking states; desynchronization of slow wave patterns was observed when the animals were aroused. When the rats were placed in the experimental chamber with alternation of sham and actual irradiation, sham exposures showed no effect either upon behavior or upon EEG patterns. Behavior and EEG were monitored until the animal went to sleep and slow waves appeared in the EEG record. The animals were then exposed to 10 sec of x-ray. At doses down to 0.2 R/sec, the EEG was desynchronized at once and usually the animals awakened. (TCO)

35268 IN VITRO REACTIONS OF LYMPHOCYTES FROM NORMAL MICE AND FROM VIRAL AND X-RAY-INDUCED LYMPHOMAS. Elrod, Lloyd M.; Schrek, Robert (Veterans Administration Hospital, Hines, Ill.). Cancer Res., 26: 1324-9(July 1966).

The in vitro reactions of lymphocytes from normal spleen and thymus of mice were compared with the reactions of cells from a viral lymphoma and from x-ray-induced lymphomas. The normal murine lymphocytes survived a shorter time than human lymphocytes but survived longer in vitro than the cells of mouse lymphoma. Mitoses were more numerous in the suspensions from the lymphomas than in normal lymphocyte suspensions. Some of the cells from both normal spleen and viral lymphomas underwent enlargement and transformation into lymphoblastoid cells. In general, the normal and neoplastic lymphocytes were sensitive to x rays (1000 R) and to prednisolone (10 μg). However, the cells from some of the x-ray-induced lymphomas were resistant to x rays or prednisolone or both. A positive correlation was obtained between resistance to the 2 reagents. In general, both normal and neoplastic lymphocytes survived longer when incubated at 27 and 15 than at 37°C. However, the cells from some of the x-ray-induced lymphomas survived relatively poorly at the low temperatures. It seemed that the x-ray-induced lymphomas were heterogeneous in the in vitro reactions of their cells to x-rays, prednisolone, and low temperatures. (auth)

35269 INFLUENCE OF SOME PHYSICAL AND CHEMICAL FACTORS ON THE MUTATION PROCESS IN PISUM SATIVUM. Sharma, B. (Timirjazev Agricultural Academy, Moscow). Genetika, No. 1, 45-52(Jan. 1966). (In Russian).

A two-year study on the effects of physical (gamma-ray and fast-neutron) and chemical (ethylenimine, diethyl sulfate, and nitroso methyl urea) mutagens on Pisum sativum permit is reported. On the whole, chemical mutagens were more effective in contrast to irradiation and induced a larger quantity of specific, new, and positive mutations. More effective mutagens induced a larger number of multiple mutations. Mutations appeared even later than at the time of treatment with mutagens. It is possible that late mutations are represented rather by point mutations than by chromosome aberrations. In order to determine accurately mutagenic effectivity it is necessary to apply the method of calculating mutation frequency on the basis of number of mutation events per 100 M_2 families. (auth)

35270 CONSTANCY OF RADIATION-DAMAGED CHROMOSOMES IN FISH EMBRYOGENESIS. Romashov, D. D.; Belyaeva, V. N. (Inst. of Biological Physics, Moscow). Genetika, No. 4, 4-15(Apr. 1966). (In Russian).

The constancy of radiation damage chromosomes in fish embryogenesis was studied. It was found that in Misgurnus chromosomes damaged by radiation, either introduced by and irradiated nucleus or formed as a result of irradiation of developing eggs, are preserved in the state of dicentric chromosomes up to the stage of a 30-day-old larva. Mitoses percentage with dicentric chromosomes was maintained in the the course of embryogenesis on a sufficiently constant level, determined both by the irradiation dose and selection grade of misdeveloped larvae. Postradiation chromosome variability of somatic tissues of fish larvae was not limited to prolonged constancy of dicentric chromosomes and formation of hypo- and hyperploid complexes but in a small percentage of cases was followed by appearance of fresh chromosome breaks and an increment of the number of polycentric mitoses. (auth)

35271 RADIOSENSITIVITY AND MUTATION FEATURES OF MOUSE EMBRYO FIBROBLASTS IRRADIATED AT DIFFERENT PHASES OF THE MITOTIC CYCLE. Mitrofanov, Yu. A. (Inst. of Biological Physics, Moscow). Genetika, No. 4, 31-7(Apr. 1966). (In Russian).

Studies were made on the origin of chromosome aberrations irradiated at different phases of the mitotic cycle.

Fibroblast from a primary culture of mouse embryo tissues were used. Duration of the mitotic cycle and its phases (G_1, S, G_2 and M) in cell populations x rayed at a dose of 35 R was determined with the help of radioactive thymidine. Irradiation with this dose caused but slight increase of the cycle duration. Cells irradiated at S were radiosensitive; in X_1 anaphases of these cells no aberrations of the chromosome type were found (only chromatid aberrations were present). Cells irradiated at G_1 were also radiosensitive (evidently cells of the late G_1 stage present an exception). Irradiation of such cells induced a large number of rearrangements of the chromosomal type (chromosome bridges) in contrast to cells of stages G_2 and S. However chromatid aberrations (for instance chromatid bridges) were formed in cells irradiated at G_1. At G_2 the chromosome reacts to irradiation both as a single and a double thread. The same evidently refers to cells irradiated at the G_2 phase. It was found that aberrations and in particular chromatid bridges not only in X_1 but in X_2 and evidently in X_3 following irradiation appear in cells irradiated at the S phase. This phenomenon was qualified as a prolonged mutability. Cells irradiated at G_1 and G_2 phases do not possess the property of prolonged mutability. (P.C.H.)

35272 OCCURRENCE OF LETHAL MUTATIONS IN THE HETEROCHROMATINIC REGION OF DROSOPHILA MELANOGASTER X CHROMOSOME DEPENDING ON PRERADIATIONAL DEVELOPMENT TEMPERATURE. **Kogan, Z. M. (Belorussian Agricultural Academy, Gorkii, SSR). Genetika, No. 4, 38-44(Apr. 1966). (In Russian).**

Drosophila melanogaster males reared at 15°C (cold series) and at 28°C (warm series), respectively were x irradiated (at a dose of 6,000 R). Subsequent crosses were carried out at 25°C. It was found that lethal mutation induction percentage in the heterochromatinic X-chromosome region (at the locus bobbed) was twice as high in the ripe sperm cells of the cold series in contrast to that of the warm series. Recessive sex-linked lethal and dominant sterility mutations also occurred more often at a lower development temperature though the difference between the temperature series in this case was far lower. In both temperature series a decrement of mutation frequency in spermatids in contrast to ripe sperm cells was observed. The decrement was highly tressed for bb^1 in dominant sterility mutants and was far less manifest for recessive sex-linked lethals. (auth)

35273 COMPARATIVE RADIOSENSITIVITY OF CHROMOSOMES IN THE CULTURED PERIPHERAL BLOOD LEUKOCYTES OF NORMAL DONORS AND PATIENTS WITH DOWN'S SYNDROME. **Chudina, A. P.; Malyutina, T. S.; Pogosyants, H. E. (Inst. of Experimental and Clinical Oncology, Moscow). Genetika, No. 4, 51-63 (Apr. 1966). (In Russian).**

The cultured leukocytes from blood of donors and patients with Down's syndrome were x irradiated at the G stage cell cycle with 10, 20, and 40 R. The frequency of metaphase chromosome breaks was studied. Most of the aberrations observed were of the chromatide type. Only 7 chromosome type aberrations were revealed among 1564 cells. No difference was found between the control and the Down's cells in total frequency of spontaneous and induced aberrations and in the dose curve (it proved to be linear for both types of the cells). The total frequency of breaks per cell per roentgen was also approximately the same and its mean value was equal to 0.012. However, when the frequency of breaks per chromosome per roentgen was calculated and this index was compared with respect to separate chromosome groups in normal and trisomic cells, it was found that the radiosensitivity of chromosomes of D, F, and G groups was 3-4 times higher in trisomic than in normal cells. (auth)

35274 INFLUENCE OF TEMPERATURE ON THE FATE OF RADIATION-DAMAGED PEA CHROMOSOMES. **Usmanov, P. D. (Inst. of Plant Physiology and Biophysics, Academy of Sciences, Dushanbe, SSR). Genetika, No. 4, 105-13(Apr. 1966). (In Russian).**

The results of experiments on temperature influence on reparation processes of γ-irradiated chromosomes are given. Temperature modification of the final output of radiation reaction is interpreted as a result of its influence on the speed of the postradiation chromosome reparation. Special experiments serve to estimate sensitivity to temperature effect of the periods of swelling and germination of seeds. It was concluded that the sensitivity region to temperature influence is not limited to the period of seed swelling but spreads also on their germination period as well. However, the most general conclusion drawn from all the experiments in question is as follows: the percentage of primarily damaged chromosomes depends only on the radiation dose and remained almost stable in the course of all the range of temperature experiments; primary damages are strictly local, and depend on the target principle. Final output of chromosome aberrations on the whole is regulated by the kinetics of the process of space restitution. (auth)

35275 NATURE OF POSTRADIATION RECOVERY OF YEAST CELLS FROM DOMINANT LETHALS UNDER CONDITIONS OF TEMPORARY DELAY OF REPRODUCTIVE ACTIVITY. **Barsukov, V. S.; Malinovskii, O. V.; Mityushova, N. M. (Pavlov Inst. of Physiology, Leningrad). Genetika, No. 4, 136-46(Apr. 1966). (In Russian).**

Kinetics of recovery of viability in γ-irradiated yeast cells incubated in water before seeding into a nutritive medium and kinetics of recovery of sublethally affected cells obtained after fractional irradiation dose were compared. Analysis of the data obtained showed that dominant lethals causing death of the irradiated cells represent double target chromosome aberrations which are formed in a parallel way with a regular recuperation of the chromosomes. The effect of viability recovery was the yeast cells, previously maintained at a status of temporary delay of reproductive activity presents the result of an increment of the probability of erroneous chromosome recuperation (appearance of irreversible lethal rearrangements) in comparison with seeding of irradiated cells into a nutritive medium directly after irradiation. (auth)

35276 PARTIAL-BODY IRRADIATION OF THE DOG. **Maillie, H. D.; Krasavage, W.; Mermagen, H. (Univ. of Rochester, New York). Health Phys., 12: 883-7(July 1966).**

The distribution of both effective beam energy and dose has been studied throughout the partially irradiated dog. Results are given for both upper (UB) and lower body (LB) exposures to 1000 kvp x radiation and are compared to a similar whole body (WB) irradiation. The effective energy at selected locations has been found to decrease from approximately 285 kev in non-shielded areas to a value of about 150 to 160 kev at points behind the shield. Although the dose falls rapidly with depth behind the shield, a small but significant component has been found. Blair's model for the addition of differing modes of radiation injury (i.e., $1/D_{WB} = 1/D_{UB} + 1/D_{LB}$) has been found to hold true if the average dose extended over the portion of the animal in question is used. (auth)

35277 THORIUM-228-INDUCED FRACTURES IN BEAGLES. **Taylor, G. N.; Jee, W. S. S.; Christensen, W. R.; Rehfeld, C. E.; Nebeker, N. (Univ. of Utah, Salt Lake City). Health Phys., 12: 889-93(July 1966).**

Significant numbers of pathological fractures were induced in beagles by a single intravenous injection of ~0.3 μC/kg or ~0.9 μC/kg ^{228}Th. Fractures were not observed at the next higher level, 2.7 μC/kg, because of early death from radiation induced nephritis and/or blood dyscrasia. Only one fracture occurred at the ~0.1 μC/kg level in nine dogs observed and no fractures were observed below this dose. This lowest level at which a fracture occurred was approximately six times higher than the dose which has induced osteosarcomas, thus far. (auth)

35278 THE POSSIBLE ROLE OF MOMENTUM IN RADIATION DOSIMETRY. III. REMARKS ON THE 1962 ICRP/ICRU REPORT. **Hollister, H. (Atomic Energy Commission, Washington, D. C.); Turner, J. E. Health Phys., 12: 949-53(July 1966). (ORNL-P-1407).**

Work in radiation dosimetry during the last several years has been directed in part toward formulations that bring to bear new experimental techniques and new theoretical ideas. Examples include the work of Rossi and co-workers, directed toward finding a detailed description of local energy absorption in tissue: Hurst and Ritchie, directed toward stating formally the problem of dosimetry in the most general way; and Turner and Hollister, directed toward finding a physical equivalence of different radiations that are made biologically equivalent by producing a given end point experimentally. These investigations have been successful in clarifying some questions. In particular, the last-named work has shown that linear momentum transfer together with energy transfer describe RBE and the dependence of RBE on LET. The explicit relationship found, based originally on neutron RBE data, also bears a marked resemblance to an empirical relationship given in the 1962 report of the ICRP/ICRU REB Committee. A discussion of these results is presented. It is found that they have a unified description in terms of incident particle velocity. The ratio of linear momentum absorbed per unit mass (P_{abs}) to energy absorbed per unit mass (E_{abs}) has, of course, the physical dimensions of reciprocal velocity. (auth)

35279 STERILIZATION OF THE MALE ALFALFA WEEVIL (HYPERA POSTICA: CURCULIONIDAE) BY X RADIATION. **Burgess, Edward E.; Bennett, Stelmon E. (Univ. of Tennessee, Knoxville). J. Econ. Entomol., 59: 268-70(Apr. 1966).**

Doses of 2000 to 10,000 R of x rays were used to determine at what level of radiation sterility is induced in the male alfalfa weevil. Sterility was determined by observing the occurrence of viable or nonviable eggs laid after x irradiated males had mated with normal virgin females. Mortality was very low and insignificant. There was no higher death rate at 10,000 R than there was at 2000 R or in the controls. Unirradiated females mated to x-irradiated males produced eggs, but most of the eggs from weevils mated with males given 2000 R through 10,000 R failed to hatch. Only 0.8% of the eggs deposited at the 4000-R level hatched. However, no hatching occurred at the higher exposures. The lower levels of radiation were successful in producing nonviable offspring, especially when comparing the experimental with the control group which produced almost 79% viable offspring. A decrease was noted in the rate of development of all embryos from sperm receiving a high level of radiation. This degree of damage increased in proportion to the dose of x rays that the weevils received. It is concluded that doses ranging from 2000 to 6000 R will not induce sterilization in the males but will produce nonviable offspring. However, at the 8000 and 10,000 R levels sterility is induced. (BBB)

35280 ROLE OF THE THYMUS IN TOLERANCE. I. TOLERANCE TO BOVINE GAMMA GLOBULIN IN THYMECTOMIZED, IRRADIATED RATS GRAFTED WITH THYMUS FROM TOLERANT DONORS. **Isakovic, Katarina; Smith, Stanley B.; Waksman, Byron H. (Yale Univ., New Haven). J. Exp. Med., 122: 1103-23(Dec. 1, 1965).**

Immunologic tolerance is a property of the pool of small lymphocytes which recirculate continuously over long periods of time between the blood and the parenchyma of peripheral lymphoid organs (splenic white pulp, lymph node cortex) and appear to be directly responsible for antibody formation, homograft rejection, and possibly other types of delayed hypersensitivity. They are probably produced in the thymus and other central organs, such as the bone marrow. The hypothesis that tolerance may result from the interaction of antigen with small lymphocytes or their precursors within these source organs was investigated. The rats were thymectomized at 5 weeks of age, and at 8 weeks all rats received 800-R whole-body x-irradiation from a 250-kv machine. Within 24 hr each animal received 1 to 2×10^8 nucleated marrow cells intravenously and a single thymus, cut into 4 or 5 large fragments, was placed subcutaneously in the left axilla. These were taken from 10-week-old donors of the same sex. Such rats, thymectomized and irradiated as adults, were restored to immunologic reactivity by grafts of normal adult rat thymus and bone marrow. Reactivity of the delayed (cellular) type and formation of mercaptoethanol-sensitive (MES) and mercaptoethanol-resistant (MER) antibody returned within 3 weeks, while Arthus reactivity remained subnormal til 9 weeks after irradiation and grafting. When the thymus donor was tolerant to BGG, the recipient showed specific nonreactivity to this antigen at 3 weeks and, to a much lesser extent, 6 weeks after grafting. This nonreactivity affected delayed responses and MER antibody. No effect was noted on Arthus reactivity and a slight effect on MES antibody. Controls showed that the nonreactivity was not due to transfer of free antigen at the time of grafting. It was concluded that different source organs are responsible for different immune functions and that specific immunologic tolerance may be induced within such an organ as the thymus. (BBB)

35281 EXTINCTION TESTS WITH MALE RHESUS MONKEYS AFTER CHRONIC EXPOSURE TO FAST-NEUTRON RADIATION. **McDowell, A. A.; Brown, W. Lynn (Univ. of Texas, Austin). J. Genet. Psychol., 108: 39-42(Mar. 1966).**

Previous research showed that an extinction criterion of 50 mmin significantly separates normal rhesus monkeys and monkeys given lab whole-body exposure to mixed neutron-γ radiation. The separation is in favor of facilitated extinction for irradiated subjects. The results were replicated with monkeys exposed to nuclear radiations in the field. The present study was done to determine if adult male monkeys exposed to chronic fast-neutron radiation also show facilitated extinction over their normal controls. Of 9 rhesus monkeys, aged 7 to 9 years, four had been exposed to chronic fast-neutron radiation more than five years earlier. They had been given a 24-hr whole-body exposure every four days at 87.2 mrep/hr until a total dose of 583 rep was achieved. The six controls had been sham exposed. Their training histories were identical and included Wisconsin General Test Apparatus (WGTA) tasks. The testing was done in a modified version of the WGTA. A stimulus tray holding two food wells, spaced 12 in. apart was used, the test object being a single, square, orange-painted wooden block. The monkeys were tested 24 trials per day for three days on response latency to a single stimulus object. Response was rewarded by food only on the first day. Testing was terminated on each trial if the subject failed to respond within 50 mmin. Controls showed significantly more trials at 50 mmin during the first day of extinction testing than irradiated monkeys. In addition, median response latencies increased to a higher level for control than for irradiated monkeys on the initial day of extinction testing. These results are in contrast to those of the previous report of facilitated extinction for irradiated monkeys. The adult male monkeys of this study not only failed to manifest facilitated extinction, but showed slower extinction than their normal controls. Procedural differences between this study and the earlier one could account for the differences in test results, or the present findings may be peculiar to whole-body exposure to fast-neutron radiations. (BBB)

35282 TECHNIQUES EMPLOYED IN IRRADIATING EXPERIMENTAL ANIMALS. **Novikova, R. E. (Central Research Inst. of the Roentgen-Radiological, Leningrad). Med. Radiol., 11: No. 1, 88-93(Jan. 1966). (In Russian).**

Animal irradiation from two sides equalizes the depth dose distribution in an animal. Increasing the source-to-skin distance has the same effect. It is desirable to have maximum scattering of the radiation by surrounding the animal with a layer of water or with bags of rice. Paraffin blocks, pieces of wood, or plexiglass also serve to scatter the radiation. Direct irradiation in air is undesirable because of the uneven dose, especially with larger animals. If mice or rats are used, the size and weight of the animals should be controlled within limits. It may be desirable to carry out the irradiation in sterile cages to avoid bacterial infection which plays an important role in the death of irradiated animals. (TTT)

35283 STATE OF PERIPHERAL VESSELS AND HEMODYNAMICS IN ACUTE RADIATION SICKNESS.

Yakovlev, V. V. Med. Radiol., 11: No. 4, 73-9(Apr. 1966). (In Russian).

Data on various arterial changes with irradiation are reviewed. Observations on the constriction of skin blood vessels, arterial tonus, and skin vessel spasms are generalized. It is noted that the maintenance of an adequate arterial blood pressure is due to a compensatory process. The arterial blood pressure usually falls with irradiation. The literature on this subject is also reviewed. The evidence indicates that the blood vessels to external organs are expanded during radiation sickness. Irradiation of the brain leads to a widening of the blood vessels in the head. The smaller vessels tend to narrow or be constricted in a manner similar to the skin vessels. The damage mechanism is due to disturbances of the nervous system and of the neuro-endocrinal regulating systems. (TTT)

35284 SOURCES OF ERRORS IN THE ASSESSMENT OF THE HEALTH CONDITION OF INDIVIDUALS EXPOSED TO LONG-TERM EFFECTS OF IONIZING RADIATION. Baisogolov, G. D.; Gus'kova, A. K. Med. Radiol., 11: No. 6, 37-43(June 1966). (In Russian).

Basic principles are presented for an appropriate evaluation of the health condition in individuals handling radiation sources. These include: accurate establishment of the range and nature of the tissue dose distribution with corresponding clinical effects; knowledge of fundamental regularities governing the development of various variants of chronic radiation sickness; careful differentiation from other diseases; and the significance of individual factors in environmental effects. Main difficulties and possible sources of errors in determining an etiological diagnosis of recorded deviations from the normal state of health and means of overcoming them are also enumerated. (P.C.H.)

35285 MORPHOLOGICAL AND FUNCTIONAL MODIFICATIONS OF THE PERIPHERAL BLOOD AND LYMPH CIRCULATION IN ACUTE RADIATION SICKNESS. Novikov, I. P. (Vishnevskii Inst. of Medicine, Academy of Sciences, USSR. Inst. of Medical Radiology, Academy of Medical Sciences, USSR). Med. Radiol., 11: No. 6, 50-4(June 1966). (In Russian).

Experimental data covering dynamics of anatomical and functional modifications occurring in the peripheral blood and lymph circulation during acute radiation sickness are presented. Investigations were performed on 14 dogs by the method of angiolymphography. Radiocontrast explorations of the blood circulation and lymphatic systems demonstrate that, following exposure of the organism to ionizing radiation in the form of a single whole-body irradiation with doses of from 400 to 1000 R, there can be seen marked disturbances of the blood and lymph circulation, which, depending upon the phase of the disease, run an undulating course. Anatomofunctional disorders in the blood and lymph circulation systems manifest themselves in the form of a changed vascular tone, modified arteriovenous and lymph circulation rate, as well as in that of vascular permeability. (auth)

35286 CHANGES IN BONES OF RABBITS AFTER ^{60}Co GAMMA IRRADIATION. Ryabkov, A. I. (Inst. of Medical Radiology, Academy of Medical Sciences, USSR). Med. Radiol., 11: No. 6, 74-8(June 1966). (In Russian).

Bone changes were studied in gamma-irradiated rabbits beginning from the first day of their life till they reached the age of 8 months. The animals were exposed to a momentary whole-body irradiation with a dose of 500 R. Roentgenological and pathomorphological analyses of the osteoarticular system helped to establish an inhibited skeleton growth. Especially sharp changes were noted in the growing areas of the bones. (P.C.H.)

35287 MASS PRODUCTION OF STERILIZED MALE AEDES AEGYPTI. Fay, R. W.; McCray, E. M. Jr.; Kilpatrick, J. W. (Public Health Service, Savannah, Ga.). Mosquito News, 23: 210-14(Sept. 1963).

Procedures for rearing and irradiation of mosquitos for field eradication studies are reported in detail. For mass production of sterilized male Aedes aegypti pupae, modifications were made in rearing large numbers of mosquitoes, in obtaining higher production of male pupae from the rearing trays, in separating the pupae from the larvae through the use of paris green or magnetic iron oxide dust, and in reducing the range of the irradiation dose during the sterilizing process. For irradiation of male pupae, they were placed on Nylon tulle stretched between two concentric plastic rings, each ring having a surface of 10 in^2, sufficient to hold 3000 pupae. After stacking 21 rings holding 60,000 pupae, the ^{60}Co source was passed upward through the center of the ring stack. This method resulted in a considerable variation in dosage, ranging from 9400 R per pupa for those on the outer periphery of the top ring to 18,750 R per pupa for those on the inner side of the ring at the center of the stack. Production checks showed that sterilization was produced even by a dose of 8400 R per pupa. Doses above 12,000 R affected the emergence of the adults and their subsequent longevity. Pupae irradiated in the inner, middle, and outer portions of the rings showed adult emergence of 77, 88, and 94%, respectively, and survival for one week of 66, 84, and 88% of the emerging adults. Considerable numbers of sterile males survived in the field cage for one week. The mating competitiveness of different aged males was determined using 2- to 7-day-old sterile and normal males at ratios of 20 : 1 : 1 and 5 : 1 : 1 sterile males : normal males : normal 2-day-old females, with 25 females in each test. The loss of competitiveness with age appeared greater with sterilized males than with normal males. In all cases, the hatch of eggs exceeded the theoretical values based on the proportions of sterile : normal males. (BBB)

35288 ESCHERICHIA COLI $B_{s-1}\gamma R$: A STRAIN RESISTANT TO X RAYS AND SENSITIVE TO ULTRAVIOLET LIGHT. Zhestyanikov, V. D. (Inst. of Cytology, Leningrad). Nature, 210: 1231-2(June 18, 1966).

Injuries caused by x-ray and ultraviolet radiation are partially reversible. Although damage caused by the two effects differs in nature (dimers of pyrimidine bases in DNA are induced only by uv light but never by x rays), dark repair after both forms of injury requires similar conditions. Whether recovery of uv and x-ray injuries is produced by identical or different mechanisms was studied by obtaining mutants capable of recovering from only one kind of injury. The mutant Escherichia coli B_{s-1} γR, which is resistant to x rays yet sensitive to uv light, was selected. The sensitivity of bacteria to uv light, x, and α rays was checked periodically and compared with the radiosensitivity of the parent strain and radioresistant mutant. X-ray resistance increased under γ-radiation but changes in uv sensitivity were insignificant. LD_{90} increased from 4 ergs/mm^2 (parent strain) to 6 ergs/mm^2 (mutant). The sensitivity to uv light was investigated in 700 sub-strains of E. coli $B_{s-1}\gamma R$ with inherited properties. The technique of double uv irradiation on nutrient agar made it possible to discern radio resistant (confluent growth) and radiosensitive organisms (which do or do not form single colonies). No strain was found more resistant to uv light. The strain E. coli $B_{s-1}\gamma R$ (nor B_{s-1}) did not enhance recovery of uv irradiated bacteriophage. The sensitivity to α particles was almost identical to parent strains. After α-irradiation (in presence of O) no recovery occurred with E. coli. (P.C.S.)

35289 INCREASED PROLIFERATION OF TRANSPLANTED MOUSE BONE MARROW CELLS BY PRE-IRRADIATION OF THE RECIPIENT. Blackett, N. M.; Hellman, S. (Inst. of Cancer Research, Sutton, Eng.). Nature, 210: 1284-5(June 18, 1966).

Transplantation of bone-marrow cells from normal-donor animals into heavily irradiated recipients rapidly restored hemopoiesis to normal. Results showed that only $\frac{1}{2}$ the number of normal bone-marrow cells was required in the pre-irradiated animals than in mice not pre-irradiated. No increase proliferation was noted in pre-irradiated recipients when bone marrow from irradiated donors was used. Absence of increased proliferation was not due to inhibition by radiation since an increased response was observed if bone-marrow cells were taken from animals directly after irradiation. A hypothesis explains the increased proliferations by the state of proliferation of the

transplanted cells and the physiological state of the recipient at the time of the cell injection. (P.C.S.)

35290 EFFECTS OF IONIZING RADIATION ON GLADIOLUS TUBERS AND SEEDS. Dryagina, I. V.; Kazarinov, G. E. (Moscow State Univ.). Nauch. Dokl. Vyssh. Shkoly, Biol. Nauk, No. 1, 91-4(1965). (In Russian).

Young and fully grown gladiolus tubers, hybrids, and naturally pollinated seeds were exposed to ^{60}Co γ radiation, x radiation, and to a fast-neutron beam, varying the doses from 50 to 75,000 R. The results indicated that for single exposures, 10 kR represents the critical dose; after irradiation at that level, only 9 to 25% of the plants survived. The surviving plants died during the next 2 to 3 years. The seeds exhibited a higher resistance against radiation than the tubers; exposure to 10 kR still allowed germination for 80 to 90% of the seeds and exposure to 0.5 to 2 kR did not affect the germinative capacity at all. Irradiation accelerated blooming in some of the species; genetic mutation was more marked among the irradiated than among the reference hybrid seeds. Radiation also caused many morphological changes in the structure of the flowers, such as albinism, stunted growth, color changes, etc. (TTT)

35291 X-RADIATION EFFECTS ON ARTEMIA SALINA L. EGGS. Burlakova, E. V.; Kakushkina, M. L.; Korneeva, N. V. Nauch. Dokl. Vyssh. Shkoly, Biol. Nauk, No. 3, 83-7 (1963). (In Russian).

A 50 mg weight of fish eggs in the wet and dry state was given x-ray doses of 2, 6, 14, 20, 30, 50, 80, 120, and 180 kR. The irradiated and control eggs were placed in a solution containing 60 g NaCl, 0.5 g NH_4SO_4, 0.5 g superphosphate, 0.5 g of potassium fertilizer, and 0.5 g of dolomite powder per 1 liter of water. The number of eggs hatched on the 9th to 11th day after irradiation was used as an indicator of the biological effect. The number of hatchings decreased with increasing doses in the interval from 75 to 180 kR. A dose up to 50 kR had a stimulating effect. No difference could be detected in the radioresistance of wet and dry eggs. (TTT)

35292 ON THE EFFECTS OF IONIZING RADIATION EMITTED FROM ^{60}Co UPON THE GERMINATION AND THE GROWTH OF TIMOTHY GRASS (PHLEUM PRATENSE L). Kumagai, Yuji; Kumagai, Ryoko (Nihon Univ., Japan). Nichidai Igaku Zasshi, 24: 947-53(Oct. 1965). (In Japanese).

Studies were made on the effects of ^{60}Co-γ irradiation on the germination and growth of Timothy Grass. Seeds irradiated with doses of 3.0×10^5 R were sowed and their germination and growth were observed. Generally, the germination and the growth of irradiated samples were always inhibited, with the higher irradiation doses producing larger inhibitory effects. (auth)

35293 MUTANTS OF PELLICULARIA FILAMENTOSA (PAT.) ROGERS INDUCED BY IRRADIATION. Ogura, Hirosuke (Kochi Univ., Japan); Sato, Toru. Nippon Shokubustu Byori Gakkaiho, 28: 280-2(Dec. 1963). (In Japanese).

A study was made of the mutants of Pellicularia filamentosa (Pat) Rogers, induced by uv and γ irradiations. The uv irradiation resulted in more diverse mutants than did γ irradiation. The mycelial mat of the original strain was gray, but that of the mutants exhibited a tendency to become white. The white mutant was non-pathogenic but the one closely related to the original strain in appearence was pathogenic for the seedling of cucumber. Most mutants did not grow in the czapek media with added 2% glucose which permitted good growth of the original strain. The mycelial growth of most mutants in the soil, particularly in the non-sterilized soil, was very feeble. (auth)

35294 U.V. SENSITIVITY OF BACTERIA: ITS RELATION TO THE DNA REPLICATION CYCLE. Hanawalt, Philip C. (Stanford Univ., Palo Alto, Calif.). Photochem. Photobiol., 5: 1-12(Jan. 1966).

The shape of uv postirradiation survival curves for some bacterial strains can be changed by simply varying the culture growth conditions after irradiation. This effect may be related to factors which cause a delay or retardation in normal growth while intracelluiar repair systems operate. Evidence is presented that the striking changes in uv sensitivity which accompany unbalanced growth are due to growth inhibition effects, specifically to the inhibition of DNA replication. Thus a striking increase was seen in the shoulder of the uv survival curve but no change in the limiting slope was obtained when cultures of Escherichia coli strain TAU completed the DNA replication cycle in the absence of concommitant protein synthesis prior to irradiation. The uv sensitivity of protein synthesis or RNA synthesis was not altered significantly by this treatment. In contrast to the result for strain TAU, there was no significant change in the uv survival curve for the uv-sensitive E. coli B_{s-1} when its DNA replication cycle was completed under similar conditions. Following a period of inhibited protein synthesis there was a delay in the reinitiation of the normal DNA replication cycle when protein synthesis resumed. This delay would allow time for an intracellular repair system to operate before the attempted resumption of normal replication. Strain B_{s-1}, which is deficient in this repair system, would not be expected to benefit from such a delay, as consistent with the observed results. A model is presented to account for lethality due to attempted DNA replication during a period of repair synthesis. The max survival for a given uv dose would be predicted for a culture which has completed the normal DNA replication cycle prior to irradiation and which is not permitted to reinitiate the cycle until all possible repair synthesis is completed. (BBB)

35295 IMMUNOFLUORESCENCE TESTS IN THE COURSE OF ^{131}I ADMINISTRATION. Massalski, Wandalin; Mlodzki, Miroslaw; Brzosko, Witold; Nowoslawski, Adam (Medical Academy, Warsaw). Pol. Tyg. Lek., 19: 1596-9(Oct. 19, 1964). (In Polish).

The possibility that doses of radioiodine used to assess thyroid function might damage the follicular tissue and cause the formation of antibodies reacting to the patient's own thyroglobulin was considered. By means of the indirect Coons method, sera of 66 patients were tested for the presence of thyroid autoantibodies before and after administration of the ^{131}I in diagnostic doses (up to 100 μC). Before ^{131}I administration, cytoplasmic fluorescence was noted in 21 cases. After ^{131}I treatment, nuclear fluorescence (7 cases) and various forms of colloid fluorescence (4 cases of diffuse fluorescence, and 1 case of flocculation-type reaction) appeared. There was a distinct tendency for disappearance of these reactions some time later. The number of cases with cytoplasmic fluorescence remained practically the same (22 cases); however, the reaction disappeared in 6 previously positive cases and became positive in 7 previously negative sera. On the basis of these inconclusive results, it is suggested that the problem of the appearance and disappearance of thyroid autoantibodies in the course of ^{131}I administration in diagnostic doses requires further study. This should include groups of thyroid patients and healthy persons not treated with ^{131}I. Immunofluorescence, due to its high sensitivity and readiness with which the entire spectrum of thyroid autoantibodies may be visualized in one simple procedure on two tissue sections, should be employed in these studies on the development of the thyroid autoimmunity. (BBB)

35296 EMBRYONIC RESPONSE TO ^{131}I. Mraz, Frank R. (Univ. of Tennessee, Oak Ridge). Poultry Sci., 45: 96-9(Jan. 1966).

Experiments were conducted to determine the effect of ^{131}I injections on chick embryos, to ascertain the lowest level at which damage to the embryo would occur, and to estimate the levels administered to the hen that would result in sufficient ^{131}I in the egg to harm the embryo. Eggs were injected with 5, 25, 50, 100, or 150 μC of carrier-free ^{131}I as sodium iodide at 8, 12, or 16 days of incubation; at 12 days, 200 or 250 μC; and at 16 days of incubation 200, 250, or 300 μC. Since levels as low as 5 μC ^{131}I are adequate to reduce ^{131}I uptake by the thyroids of cockerels receiving it as 16-day embryos, 0, 0.5, 1, 2, 3, 4, 5, 25, and 50 μC

^{131}I were injected into eggs each at 16 days of incubation to ascertain how low a level of ^{131}I could measurably affect the thyroid. To assess the levels necessary in a single dose to the hen to damage the thyroids of chicks hatched from her eggs, hens were intramuscularly injected with 0.5, 1, 2, or 4 mC carrier-free ^{131}I. Hatchability was reduced in embryos injected with ^{131}I levels of 25, 50, and 100 μC or higher at 8, 12, and 16 days of incubation, respectively. None of the lower ^{131}I levels (0 to 50 μC) administered at 16 days of incubation affected hatchability. Growth to 4 weeks of age, however was significantly reduced at the 50-μC level. Thyroid ^{131}I uptake at 4 weeks of age was reduced by all levels of ^{131}I administration. The max amounts of ^{131}I found in the eggs from hens intramuscularly administered 0.5, 1.0, 2.0, and 4 mC were 13, 35, 58, and 88 μC, respectively. No effect could be seen on growth rate of chicks regardless of the amount of ^{131}I found in the egg at time of incubation. However, as ^{131}I found in the egg at time of incubation increased, thyroid weights of chicks at 4 weeks of age hatched from these eggs decreased. The uptake of ^{131}I in these chicks at 4 weeks of age also decreased. (BBB)

35297 RADIOMIMETIC BEVERAGES, DRUGS, AND MUTAGENS. Sax, Karl; Sax, Hally J. (Univ. of Georgia, Athens). Proc. Nat. Acad. Sci. U. S., 55: 1431-5(June 1966).

The effects of radiomimetic agents on induction of chromosome aberrations in onion root tip cells were compared with the effects of gamma radiation at a dose of 25 and 50 R/day. The results showed that chromosome aberrations, comparable to those induced by radiation, were produced by alcohol, coffee, some antinauseant drugs, and by mutagenic agents. (P.C.H.)

35298 RADIATION EFFECTS ON ARABIDOPSIS THALIANA. II. KILLING AND MUTAGENIC EFFICIENCIES OF HEAVY IONIZING PARTICLES. Fujii, Taro; Ikenaga, Mituo; Lyman, John T. (National Inst. of Genetics, Misima, Japan. Univ. of California, Berkeley). Radiat. Bot., 6: 297-306(Aug. 1966).

Dry F_2 seeds obtained from F_1 hybrids between a hairless mutant and the wild strain of Arabidopsis were subjected to γ rays from a ^{137}Cs source and ^{4}He to ^{12}C and ^{40}Ar ions. The range of heavy ionizing particles is very short and therefore the small Arabidopsis seeds seemed to be a suitable material. The average seed volume was calculated roughly from the weight and measurements of length and width of the seeds, to be 20.5×10^{-3} mm^3. From this calculation it was concluded that Ar-ions must be stopped within the seeds but He-ions and C-ions certainly could penetrate and pass through seed tissue. Germination and survival rates in the control and in two γ-ray lots were very good. Survival rates decreased markedly with increasing dosage in the heavy-ion lots, especially those treated with He-ions. The frequency of plants with hairless sectors induced by somatic mutation per rad increased with increasing dosage in γ-ray, C-ion, and Ar-ion lots. Somatic mutation rates in the C-ion lots were very high; those of Ar-ion lots were very much lower. On the other hand, only one mutated plant was observed in one He-ion 2-krad lot, and the other four lots treated with He ions showed no mutation. An exponential relation was observed between mutation frequency and γ dosage. In heavy-ion treatments, the frequency vs dosage relation was fairly linear. RBE for somatic mutation at 0.5% frequency was roughly estimated as 35 for C-ions. An estimate of the RBE for He-ions was difficult to obtain, but on the basis of the observation made at a dose level of 2 krad the RBE for somatic mutation with those ions may be around 10. From the results, the difference in dose vs mutation rates between γ rays and heavy ions, and the LET vs RBE relation, are discussed. (auth)

35299 EFFECTS OF X RAYS ON FREQUENCY OF MUTATIONS IN HYDRATED WILD-TYPE TOMATO POLLEN. Shapiro, N. (Smith Coll., Northampton, Mass.). Radiat. Bot., 6: 337-50(Aug. 1966).

Wild-type tomato pollen was treated at 2 temperatures, subjected to 5 moisture treatments, and 5 x-ray exposures. In addition, pollen treated as above was stored dry for 1 day before pollination. The major problem was to evaluate the effects of x rays on the frequency of mutations in hydrated pollen. Here, response was measured using 5 criteria: seed set, R_1 seed germination, R_1 phenotypic changes, R_1 pollen fertility, and R_2 mutations from R_1 plants. The data on seed set supported the hypothesis that: (a) seed set was decreased with an increase in dose when pollen was treated at 25°C. However, seed set was generally higher when pollen was treated at 0°C. (b) Treated dry pollen set less seed than moist pollen. There were only slight differences in seed set due to moisture per se but hydrated pollen treated at 25°C for $\frac{1}{2}$ hr and at 0°C for 3 hr gave the best seed set. In general, the LD_{50} based on average seed set for dry and hydrated pollen was not the same for 25 and 0°C. (c) Pollen stored in hydrated condition produced less seed than non-stored hydrated pollen. Dry pollen treatments were found to reduce seed germination of the R_1. In general, the percent seed germination of the R_1 derived from treated dry pollen was lower than that from irradiated hydrated pollen. Pollen treated at 0°C yielded R_1 seed that germinated better than R_1 seed derived from pollen treated at 25°C. Among the recovered R_1 seedlings with phenotypic changes, morphological off-types occurred more frequently than chlorophyll and B types. A high percentage of these types, however, were not recovered in the R_2 generation. At 25°C, treated dry pollen and treated moist pollen yielded the same total percentage of R_1 seedling off-types. On the other hand, differences in R_1 types were found at 0°C. The phenotypically normal R_1 plants were classified for pollen fertility. The data from both 25 and 0°C treatments indicated that pollen fertility of the R_1 plants decreased as a result of dry pollen irradiation. In addition, pollen fertility was found to decrease with an increase in x-ray exposure at both 25 and 0°C. Finally, the percentage of R_2 families that segregated for mutations was relatively high after dry pollen treatments at 25°C. At 0°C, there were little differences between dry and moist pollen treatments. (auth)

35300 SECOND CYCLE OF MUTATION AND SELECTION FOR QUANTITATIVE VARIATION IN TRIFOLIUM SUBTERRANEUM. Brock, R. D. (CSIRO, Canberra, Australia). Radiat. Bot., 6: 357-69(Aug. 1966).

Early and late flowering populations of Trifolium subterraneum (subterranean clover), selected after one cycle of radiation and selection, were exposed to a second radiation treatment. The response in the first generation after re-irradiation (RM_1 generation) was similar to that observed after the first radiation treatment. The second generation progenies from re-irradiated seeds had increased variation for flowering time and they responded to selection, but the response was only approximately 20% of that obtained after the first radiation treatment. The response to selection in the early population was symmetrical, but in the late population it was skewed towards lateness. The additional response resulted in a 23.2 day difference between the means of the earliest and latest flowering families. The second generation control plants which were not given a second radiation treatment appeared to have residual variation for flowering time from the first radiation treatment, but they did not respond to selection. While the flowering time responses were achieved in families that did not differ morphologically from the control variety, examination of seedling growth rates revealed that the means of the flowering time selections were depressed in relation to the controls. The variation between individual families appeared to have been increased and it was possible to select families with growth rates not differing significantly from the control mean. The results suggest that random mutations cause an increase in the variance and a shift in the mean away from the direction of previous selection for all quantitatively inherited systems. This, taken with the diminishing return from a second cycle of radiation and selection suggests a burst of mutations followed by recombination of selected lines as the best method of utilizing induced mutation for improvement of quantitative characters. At all phases selection pressure must be kept on all important characters otherwise they will regress. (auth)

35301 STIMULATION OF THE IMMUNE RESPONSE IN RABBITS, BY INJECTION OF HOMOLOGOUS SERUM FROM IRRADIATED DONORS. Petrescu, Dorin; Boros, Ion; Schiau, Sorin; Stoenescu, Radu; Grigorescu, Stefan; Corneci, Ion (Danielopolu Inst. of Normal and Pathologic Physiology, Bucharest). Rev. Roum. Physiol., 1: 175-80 (1964).

Although it is well known that destruction of antibody-forming cells or their precursors is responsible for inhibition of the immune response after whole-body ionizing irradiation, the possible intervention of humoral factors in this radioinduced inhibition has not been fully investigated. Therefore, efforts were made to detect a factor in the blood of irradiated animals that might condition the response to antigen stimulation. To this end, two groups of normal rabbits injected with heterologous antigens also received several injections of serum taken from x-irradiated (800 to 1000 R) rabbits. A group of controls immunized under the same conditions received injections of normal rabbit serum. The mean antibody titers were higher in the first two groups than in the controls. It is inferred that irradiation causes the appearance of humoral factors tending to counter the inhibitory effect which x rays are known to exert on antibody-forming cells. The possible nature of the stimulatory factors is discussed. They might be anabolic factors produced either by the adrenals or by other organs as a response to irradiation; in this case, their action, when injected into rabbits subjected to active immunization, would be to cause an enhancement of the immune response, by direct stimulation of the antibody-producing cells. Or, they might be disintegration products or irradiated tissues; when injected, they could act as stressing agents upon certain tissues, such as adrenals, the endocrine secretions of which could lead to an enhancement of antibody production. (BBB)

35302 IMMUNOLOGICAL PROBLEMS OF RADIATION CHIMERAS. Lengerova, Alena Rozpr. Cesk. Akad. Ved, Rada Mat. Prirodn. Ved., 74: 1-93(1964). (In Czech).

Experiments in mice are described which show that radiation chimeras acquire immunologic reactivity due to the fact that lymphoid elements of donor origin repopulate the host's tissues depleted by irradiation and take over their immunologic function. It was also demonstrated that the pattern of immunity established prior to irradiation is relatively radioresistant; the radiation chimera may thus give a secondary response to antigens to which the donor of the therapeutic graft and also the recipient had been exposed. When the graft is obtained from an immunologically mature donor, it usually is immunized by host antigens. The resulting graft-vs-host reaction is the cause of the pathologic conditions seen in homologous and heterologous radiation chimeras, referred to as secondary disease or foreign bone marrow reaction. Since this syndrome develops late after irradiation, the possibility was also considered of whether it might be due to the gradual recovery of host lymphoid tissues and a delayed rejection of the transplanted cells. Experiments carried out in model systems allowing only a one-way reaction to take place strongly support the concept of graft-vs-host reaction as the mechanism involved in the delayed mortality of radiation chimeras. Experiments showed that the therapeutic superiority of the fetal cells over those derived from immunologically mature donors is primarily due to their capacity of acquiring immunological tolerance. The tolerance-responsive period of the transplanted fetal cells is markedly prolonged as compared to that of their original donor. In a given combination of two cell grafts, cells of a certain genotype may appear more competent in the competitive repopulation of host tissues. (TCO)

35303 ELECTRON MICROSCOPE STUDY ON VIRAL CHICKEN SARCOMA. II. PATTERNS OF VIRUS MULTIPLICATION IN TUMOR CELLS SUBMITTED TO X-RAY INDUCTION. Narimatsu, Eimei (Sapporo Medical Coll.). Sapporo Igaku Zasshi, 24: 271-90(Oct.-Nov. 1963). (In Japanese).

Elevation of the detectability of virus particles in tumor cells in chickens caused induction agents and possible mechanisms of the induction phenomenon were investigated. Various doses of x rays and methylcholanthrene and nitromin were used as induction agents, and it was found that the inducing capacity of x rays was larger than those of the two other agents. X irradiation with 200 R was most effective among the doses between 50 and 2,000 R. A striking elevation of the virus detectability facilitated a study on the mechanism of the virus production. On the surface of the induced tumor cells, a tiny protrusion of the cell membrane occurred like a bud with an increase in electron-density of the area. The bud was rounded and separated from the cell surface, this budding finally resulted into the formation of mature virus particles. Another pattern of the virus production seems to be quite different from the former pattern and this was observed merely in the induced cells. In this case, the virus particles were produced on the cell surface as well as on the inner surface of cytoplasmic vacuoles in the form of a cluster of grapes. The particles were crowded with amorphous substances which are considered to be mucoprotein in nature. Possible mechanisms of the induction of the tumor cells and the enhancement of the virus production are discussed in detail. (auth)

35304 ANATOMICAL AND FUNCTION RELATIONS IN RADIATION DAMAGE OF THE LACRIMAL SYSTEM OF THE RABBIT. Balik, J. (Karlovy Univ., Prague). Sb. Lek., 68: 44-57(1966). (In Czech).

In adult rabbits, injury to the lacrimal system was caused by x irradiation with doses of 2000 to 2400 R delivered to the inner and outer canthus of the eye. To promote the pathologic changes another dose of 2000 R was used on one side of each canthus. Before irradiation and during subsequent two-week intervals for four months the secretion of Cl, Na, K, glucose, and lysozyme and other proteins into tears was investigated. Irradiation of Harder's gland caused gradual damage of the cells and basal membrane including changes in the cellular element involved in the elaboration, secretion, and collection of tears. The quantitative decrease of the secretion amounted to 40% of the original value. With regard to the composition, the secretion of glucose into tears was affected least, the percentage distribution of lysozyme and other proteins varied only slightly from the normal value. The observed greater secretion of chloride ions and alkali metal ions was probably due to their release from the injured cells. The secretion thus reflected histological as well as functional aspects of impairment. During the subsequent six-week period half the rabbits were treated with syntostigmine, injected subcutaneously daily. A favorable effect of this drug on the amount and composition of tears was demonstrated. (BBB)

35305 THE EFFECT OF VARIOUS NOXIOUS STIMULI ON THE BLOOD-BRAIN BARRIER. I. THE CHANGE IN BLOOD-BRAIN BARRIER AND IN CAPILLARY PERMEABILITY IN THE EARLY STAGE OF RADIATION INJURY. Hsueh, Chuan-fu; Hsu, Shu-hui; Chu, Po-chun (Inst. of Experimental Medicine, Peking). Sheng Li Hsueh Pao, 28: 199-207(June 1965). (In Chinese).

The permeability of the blood-brain barrier (BBB) and of the capillaries was studied one to three hours after subjecting rabbits to 800-R whole-body ^{60}Co γ irradiation. In one experiment, ^{131}I-tagged serum protein was used as the tracer substance, and in the other citrate-buffered $^{51}CrCl_3$. The permeability of the BBB was expressed in two different ways: ratio A, the ratio of the amount of radioactivity per g of brain tissue to the average amount of radioactivity injected per g of body weight; and ratio B, the ratio of the amount of radioactivity per g of brain tissue to that per ml of plasma. Capillary permeability was measured by the rapidity of disappearance of the isotope from the circulation in terms of half-clearance time ($T_{\frac{1}{2}}$). After irradiation, both ratio A and ratio B were markedly increased in experiments with ^{131}I-tagged serum protein. The radioiodine found in the brain was protein bound. In experiments with $^{51}CrCl_3$, ratio A was markedly increased, but ratio B did not show a consistent change. This was because the plasma level of

$^{51}CrCl_3$ in the irradiated animals was much higher than that in the control, thus rendering ratio B practically unchanged, despite the increased penetration of radiochromium through the BBB of the irradiated animals. The high plasma level might have resulted from circulatory disturbances coincidental with the shock-like state occurring soon after exposure to lethal irradiation. If ratio B alone were used as the parameter of BBB permeability, a fallacious conclusion would have been reached. A macromolecular substance like radioiodinated serum protein is therefore more suitable for the study of the permeability of the BBB. Following irradiation, the capillary permeability was decreased, as the plasma half-clearance time was considerably prolonged with whatever tracer substance was used. (TCO)

35306 THE INFLUENCE OF IONIZING RADIATION ON THERMOSTABLE INHIBITORS IN SERUM AND ON THE BEHAVIOR OF THE SAME IN THE EFFECTS OF STAPHYLOCOCCUS TOXINE. PART II. **Chudomel, Vladimir; Rerabek, Emmy; Svoboda, Milan; Solar, Vaclav (Institut fuer Haematologie und Bluttransfusion, Prague. Institut fuer Seren und Impfstoffe, Prague).** Strahlentherapie, 130: 265-79(June 1966). (In German).

The titer of thermostabile inhibitors occurring in serum of rabbits exposed to ionizing radiation was estimated in a system erythrocyte-staphylococcus toxin, and the action on cells of serum factors produced in irradiated animals was studied in tissue culture experiments. The titer of serum inhibitors dropped after body irradiation. This was shown by a reduced capability of the serum to inhibit hemolysis caused by the staphylococcus toxine. A dependence on the time elapsed between irradiation and the bleeding was also found. Serum of irradiated rabbits was able to potentiate the hemolytic action of the staphylococcus toxin. This activity was found in sera of blood drawn 48 hours after whole-body irradiation. Serum of irradiated rabbits contains factors with the ability for strengthening the cytotropic action of the staphylococcus toxin on human HeLa- and Detroit-6-cells, on the Clone 929 of mouse L-cells, and on a line of rabbit kidney cells. (auth)

35307 STUDIES ON THE NITROGEN METABOLISM IN FROG LIVER AFTER WHOLE-BODY IRRADIATION. IV. INFLUENCE OF SPLENECTOMY, SPLEEN EXTRACT AND SERUM OF IRRADIATED FROGS ON THE NITROGEN EXCRETION BY PERFUSED FROG LIVER. **Antonijevic, Milos; Lebez, Drago (Nuclear Inst. Jozef Stefan, Ljubljana, Yugoslavia).** Strahlentherapie, 130: 280-4(June 1966).

Splenectomy performed 14 days prior to irradiation with 400 R improved the nitrogen balance in the perfused frog liver. Administration of spleen extracts prepared either from normal frogs or frogs exposed to a dose of 650 R resulted in a decrease of nitrogen excretion by perfusate while administration of serum to perfusion liquid had no influence upon nitrogen metabolism in the liver. An attempt to demonstrate the noxious effect of irradiated spleen on the nitrogen metabolism in liver using the spleen extracts of irradiated frogs was not successful by perfusion technique. (auth)

35308 PRODUCTION OF LONG-TERM LYMPHOCYTOPENIA IN PRIMATES BY CHRONIC EXTRACORPOREALLY SHUNTED BLOOD. **Cobb, Ben G.; Ansell, Julian S. (Univ. of Washington, Seattle).** Surg. Forum, 16: 498-500(1965).

In male Kenya baboons weighing 6 to 8 kg, an artificial kidney cannula was inserted as a shunt between the femoral artery and vein. A 250-kv x-ray therapy machine served as the source of radiation. The volume irradiated at any given moment was about 2 ml, at 35 to 40 R/transit. One animal's blood was irradiated for 5 min daily, a second for 30 min, a third continuously for 16 hr, then for 1 hr/day, and 6 animals had their shunts irradiated for 4 hr daily. In animals the blood of which was irradiated 4 hr daily, depression of lymphocytes below 2000 mm^3 occurred after 8 days and the level dropped below 500 mm^3 between 8 and 16 days. The total white count was not significantly altered by less than 100-hr irradiation. The lymphocyte count returned to normal within 7 days after irradiation was discontinued. The length and periodicity of dose required to lower and maintain lymphocyte counts below 1000 mm^3 (8 days at 4 hr/day) suggest that an extravascular pool of lymphocytes is being tapped and destroyed. Lymph nodes of sacrificed animals showed depletion of germinal centers. Whether or not selective destruction of lymphocytes by extracorporeal irradiation will induce tolerance to allografts was not investigated. (BBB)

35309 HERITABLE HISTOCOMPATIBILITY CHANGES: LYSOGENY IN MICE. **Bailey, Donald W. (Univ. of California Medical Center, San Francisco).** Contract AT(11-1)-34. Transplantation, 4: 482-8(July 1966).

A series of five experiments on histocompatibility gene mutation as detected by tail-skin graft tests in isogenic mice was completed. To explain the results it is hypothesized that the observed histocompatibility changes were the result of the incorporation of viral genomes into germinal cells of parents in a manner paralleling the phenomenon of lysogeny in bacteria. This hypothesis would explain why most changes were gains in antigen, why paternal x irradiation had no detectable augmenting affect on incidence, but why the environment in which the parents were born and raised did seem to affect the incidence. The hypothesis is extended to explain the origin and function of the histocompatibility and blood-group genes. (auth)

35310 PATHOGENESIS OF THE AFTEREFFECTS OF RADIATION. **Aleksandrov, S. N. (Central Scientific Research Inst. of Roentgenology and Radiology, Leningrad).** Vest. Akad. Med. Nauk SSSR, No. 9, 11-13 (1965). (In Russian).

Direct ionizing radiation sets in motion a chain reaction consisting of four links. The first or primary link is the irreplaceable loss of certain cells, permanent changes in irradiated cells, and hereditary changes in somatic cells. These changes, which may persist even after disappearance of the clinical symptoms of acute radiation sickness, directly or indirectly give rise to a second link — secondary changes of a compensatory nature (e.g., hyperplasia of bone marrow). The primary and secondary disorders activate a third link — qualitative and quantitative impairment of reactivity of various systems. The result is the fourth pathogenetic link, limitation of the protective and adaptive capabilities of the body, manifested chiefly in heightened sensitivity to injurious agents and an unusual course of intercurrent diseases. This chain reaction initiated by permanent primary changes results in premature exhaustion of vital reserves and reduced life expectancy. (ATD)

35311 BIOPHYSICAL ANALYSIS OF THE PRIMARY BIOLOGICAL EFFECTS OF RADIATION. **Luchnik, N. V. (Inst. of Medical Radiology, Obninsk, USSR).** Vest. Akad. Med. Nauk SSSR, No. 9, 14-18(1965). (In Russian).

Studies on the mechanism of radiobiological effects on the cytogenetic, macromolecular, and primary reaction levels are reviewed, and the primary processes underlying radiobiological effects are described. Absorption of radiation energy by the living cell gives rise to several primary reactions, none of which is decisive; both the direct and indirect effects are significant. Potential injuries to the genetic structures seem to be due to changes in the nucleoproteins, specifically isolated ruptures of DNA; energy metabolism, impaired by radiation, also plays an important role in the biochemical changes. Some aspects of radiosensitivity, chemical protection (the concept of potential injuries justifies the search for drugs that may be effective in preventing cytogenetic damage even after irradiation), and carcinogenesis are also briefly discussed. The similarity of carcinogenesis to mutagenesis suggests the desirability of investigating agents capable of increasing or decreasing the number of chromosome aberrations. (ATD)

35312 ENERGY-PRODUCING PROCESSES AND POST-RADIATION CELL RECOVERY. **Mosin, A. F.; Ivanova, R. P.; Karabaev, E. M. (Inst. of Medical Radiology,**

Obninsk, USSR). Vest. Akad. Med. Nauk SSSR, No. 9, 40-4(1965). (In Russian).

Yeast cells were used in a study of respiration and fermentation, two processes intimately associated with cell recovery after irradiation. Intensity of respiration was found to be much higher in irradiated than in unirradiated cells, the rate being directly proportional to the dose. The experiments showed that yeast strains capable of recovery after irradiation consume much more oxygen than do strains that do not possess this capacity. The latter include haploids which lose their ability to multiply indefinitely after exposure to ionizing radiation. It is suggested that intensification of the oxidation processes in irradiated cells is a means of detoxifying the products generated by irradiation. A relationship was found between the restoration of irradiated yeast under anaerobic conditions and the cell concentration in suspension, the amount of glucose per cell being equal. The denser the cell suspension, the lower the level of recovery. This may be due to the accumulation of the end products of metabolism in the medium. Even with fairly low concentrations of alcohol (2–4%), recovery in the presence of glucose in dilute suspensions was greatly inhibited. (ATD)

35313 REACTION OF THE NEUROSECRETORY NUCLEI OF THE HYPOTHALAMUS, THYROID, AND ADRENAL GLANDS TO RADIATION INJURY OF THE ORGANISM. Voitkevich, A. A.; Tkachev, A. V.; Chekunov, A. S.; Obchinnikova, G. A.; Palyga, G. F. (Inst. of Medical Radiology, Obninsk, USSR). Vest. Akad. Med. Nauk SSSR, No. 9, 44-52(1965). (In Russian).

A study of the neurosecretory nuclei in rats exposed to polonium-210 revealed a three-stage development of changes in the neurons of the paraventricular and supraoptic nuclei. Immediately after exposure the neurosecretion flowed rapidly along the axons, after which elimination and synthesis were in a state of relative balance. Finally, inhibition of neurosecretion set in, ending in partial destruction of the neurons. The adrenals were studied on the same material at different periods of acute radiation sickness. Within 24 hours of exposure the glands increased in weight almost 1½ times. This increase as well as the histological changes were indicative of marked hypertrophy of the glands due to intensified production of hormones. The structural and functional changes observed in the thyroid were more or less similar to those in the adrenals. Under normal conditions the peripheral endocrine glands are elements in a closed system — hypothalamus-hypophysis-thyroid-adrenal-hormone — metabolism in peripheral tissue. Introduction of ^{210}Po disrupts hormone metabolism, which gives rise to compensatory intensification of the thyrotropic and adrenocorticotropic functions of the hypophysis, resulting in hyperstimulation of the thyroid and adrenals. The isotope accumulates selectively in the neurosecretory nuclei of the hypothalamus and ultimately destroys them. (ATD)

35314 TRANSPLANTABLE FIBROSARCOMA INDUCED IN PUREBRED RATS BY PLASTICIZED RESIN AND ^{60}Co GAMMA RADIATION. Podsosov, S. P.; Kharlampovich, S. I. (Inst. of Medical Radiology, Obninsk, USSR). Vest. Akad. Med. Nauk SSSR, No. 9, 52-5(1965). (In Russian).

A group of mature male rats of the August strain was exposed once to ^{60}Co gamma radiation (545 rads) and another group served as controls. Plasticized resin plates were implanted in a subcutaneous pocket in the right abdominal wall of both groups of animals. Within 8–13 months the irradiated animals developed malignant tumors, whereas no tumors were found in any of the control rats. These fibrosarcomas were then transplanted to two groups of rats (215), some irradiated with a dose of 150–400 rads, the others left unirradiated. The tumor took in 106 (99.06%) of the 107 irradiated animals and in 99 (91.66%) of the 108 control rats. There were perceptible differences between the two groups with respect to the growth rate, morphology, size, and weight of the tumors and survival time of the animals. (ATD)

35315 SOME ASPECTS OF THE IMMUNOPATHOLOGY OF ANIMALS CHRONICALLY EXPOSED TO RADIOACTIVE ZINC (^{65}Zn). Filatov, P. P.; Gaidova, E. S. (Inst. of Medical Radiology, Obninsk, USSR). Vest. Akad. Med. Nauk SSSR, No. 9, 65-70(1965). (In Russian).

Daily peroral administration of $^{65}ZnC_2$ (10 μC per kg of weight) to rabbits for 18 months significantly altered the animals' antigen structure and protein fractions and brought about morphological changes in various tissues. Antibodies against homologous denatured protein clearly appeared during the 9th month. At the same time there was a marked decrease in the serum albumins while the quantity of gamma and beta globulins increased and the albumin-globulin ratio underwent phasic changes, which suggests dysglobulinemia. Tissue changes in the hematopoietic organs included hyperplasia of the reticuloendothelial elements, increase in the number of foci of extramedullary hematopoiesis in the spleen, lymph nodes, and lungs, and enlargement of staff and band cells in bone marrow. Degenerative changes were noted in the liver, kidneys, thyroid, and gonads. Signs of radiation lesions appeared between the 16th and 18th months. Rabbits given smaller doses of ^{65}Zn exhibited the same immunological and morphological changes as those receiving the 10 μC/kg dose but they were less pronounced. Autoimmunological mechanisms play a major role in the pathogenesis of chronic radiation damage. (ATD)

35316 ANALYSIS OF CHANGES OCCURRING IN THE COMPOSITION OF SERUM PROTEINS IN RADIATION INJURIES OF ANIMALS. Kashkin, K. P.; Aleksandrova, S. V. (Inst. of Medical Radiology, Obninsk, USSR). Vest. Akad. Med. Nauk SSSR, No. 9, 93-6(1965). (In Russian).

Because of their high degree of resolution immunochemical and biochemical methods were used to study serum proteins of various animals that had been subjected to ionized radiation. Nonlineage mice were irradiated with 1000 rad of x rays, while "August" rats and Macacus-rhesus monkeys were exposed to ^{60}Co gamma rays in doses of 630 and 750 and 550 and 630 R, respectively. Highly sensitive rabbit sera were employed in the analyses. Among the quantitative differences noted in irradiated animals was an overall decrease in serum proteins which was due primarily to a decrease in the albumins and secondarily to a decrease in gamma globulins. In contrast, an increase in alpha and beta globulins was observed in irradiated animals. However, this increase was not evenly distributed among all the components of these globulins in that certain ones were seen to drop significantly while others increased. In addition to these, several qualitative differences were observed in irradiated sera. Notable was the appearance of new fractions, absent from control sera, which increased in concentration with the progress of the radiation injury. Following radiation injury some tissue antigens gain access to the blood and their circulation may play an important role in the development of future effects of irradiation. (TCO)

35317 EFFECTS OF VARIOUS TYPES AND DOSES OF IONIZING RADIATION ON PRELIMINARY IRRADIATED SEEDS OF SUMMER WHEAT. Gabbasov, A. M.; Baidauletov, O. K. Vestn. Akad. Nauk Kaz. SSR, No. 11, 66-77(Nov. 1965). (In Russian).

The results of experiments with various ionizing doses showed that the presowing irradiation of summer wheat seeds by comparatively small doses of uv, x and γ rays and thermal neutrons produced stimulating effects and increased the harvest. It was also observed that stimulating doses of thermal neutrons and x radiation did not induce genetic changes in summer wheat while uv rays sometimes resulted in genetic alterations presowing irradiation of summer wheat seeds with critical doses of thermal neutrons and γ rays inhibited the survival of plants, induced high genetic changes and increased mutagenic effects. (R.V.J.)

35318 STATE OF LAMBS POISONED WITH ^{90}Sr. Panchenko, I. Ya.; Puchkova, S. M. Veterinariya, 42: No. 5, 77-80(1965). (In Russian).

Lambs, age 2 to 2.5 months, were given a single oral dose of 1, 10, 100, or 1000 μC of $^{90}Sr(NO_3)_2$/kg. Hemoglobin, blood serum protein and its fractions, residual N, and blood elements were then followed for one year. Radiation disease developed in all but the 1-μC group. (P.C.H.)

35319 REACTION OF TISSUE CULTURE CELLS TO X-RAY RADIATION FOLLOWING FOOT-AND-MOUTH DISEASE INFECTION. Sushkov, F. V.; Ryabov, V. I.; Karpov, O. N. Vop. Vet. Virusol., 1: 67-74(1964). (In Russian).

Tissue cultures of kidney cells from cattle were x irradiated with 500, 1000, and 3000 R with a dose potency of 1000 R/min. After 2, 4, 8, 12 hr, 1, 2, 3, 4, 5, or 6 days, the cultures were prepared for RNA and DNA determinations. Glycogen was determined by the Schick reaction, and neutral HCOH (10%) was used to demonstrate free and bound lipids. In five experiments the culture was irradiated with 1000 R and infected with foot-and-mouth disease virus. All irradiation produced distinct depression of mitotic activity. Nuclei exhibited fragmentation, polyploidism, and reduced DNA synthesis. Cytoplasm, in the absence of morphological changes, revealed considerable changes in the amount of glycogen and lipids. The irradiated cultures also exhibited regular increase of the nuclear sizes, apparently related to the restoration of the DNA synthesis and polyploid formation. Virus cytopathogenic action appeared earlier and more intense in the irradiated culture. (P.C.H.)

35320 IMPORTANCE OF MICROMUTATIONS IN BREEDING. I. VARIABILITY IN GRAIN YIELD, GRAIN SIZE, AND GROWTH PERIOD INDUCED BY X RAYS IN HAISA II BARLEY. Gaul, H. (Max-Planck-Institut fuer Zuechtungsforschung, Cologne). Z. Pflanzenzuecht., 55: 1-20(Feb. 1966). (In German).

Six generations of Hordeum vulgare Haisa II variety plants were examined after x irradiation of seeds to 20,000 R. Studies of variability began with the random selection of 2024 normal-appearing M_2 plants and an equal number of control plants. Grain yield, grain size (measured by thousand-grain weight), and growing period (measured as date of ear emergency) was studied in the M_3 to M_6 generations. Induced variability of grain yield is of primary importance for breeding purposes, thus, emphasis was placed on this character. In both the M_5 and M_6 generations one selection step for grain yield was performed, both in a positive and a negative direction. Analysis of variance in the M_3 and M_4 generations shows a fall of 4 to 5% in the mean yield of the M lines in comparison with the control lines, along with a considerable increase in the genotypic variance for yield. The phenotypic frequency distributions show that the greater part of the induced genetic variability is negative in character. The extremes in the M_3 and M_4 lines gave the most high-yielding control lines. For this reason alone it is concluded that positive variance for yield is also induced. From the form of the distribution curves it appears that a large number of micro-mutations has occurred; the frequency of micromutations was estimated as at least 50 times higher than that of macromutations. Notwithstanding the low heritability of the character grain yield, selection in both directions had a clearly detectable effect. It was possible to extract from the gene pool of the M_2 generation positive and negative populations which displayed significant differences in their mean values and their variances. The phenotypic frequency distribution of the M_6 lines also shows clearly that positive yield variance has been selected. Thus, it should be possible to isolate induced micromutations with increased yield potential in the following generations. (TCO)

35321 INVESTIGATIONS ON RADIATION BIOLOGY IN CEREAL SPECIES. I. DIFFERENT RADIATION SENSITIVITY OF GERMAN WINTER WHEAT VARIETIES. Walther, F. (Kernforschungsanlage, Juelich, Ger.). Z. Pflanzenzuecht., 55: 67-80(Feb. 1966). (In German).

Preliminary to an investigation of the cause of differences in radiation sensitivity, a search was made within the genus Triticum aestivum for varieties that differ sharply in this respect. Air-dried seed of 45 German winter wheat varieties was subjected to an x irradiation dose of 10 to 30 kR. Radiation sensitivity was measured by determining growth depression in the primary leaf, survival rate and alterations in leaf number in the individual plants. In this way very marked varietal differences in radiation sensitivity could be found in the samples tested, the most sensitive varieties having a survival rate of only 50% after irradiation with 20 kR whereas the most resistant had 85% survivors even after irradiation with 30 kR. The six most sensitive varieties (no plants developing after 30 kR) were: Anda, Carsten's VI, Rimpau Braun, Titus, Walthari, and Welo. The most resistant varieties were (followed by percentage surviving plants after 30 kR): Agus (69%), Bastard II (95%), Bayro (96%), Heine's VII (81%), Meister (85%), and Triumph (91%). Considering all the varieties tested, depression of plant height averaged 7.4% after 10 kR, 53.2% after 20 kR, and 91.1% after 30 kR. (BBB)

35322 HEMATOLOGICAL CHANGES IN THE ACUTE RADIATION SYNDROME: QUANTITATIVE AND QUALITATIVE EFFECTS OF TOTAL BODY IRRADIATION ON LYMPHOCYTES IN THE INTESTINAL LYMPH OF THE RAT. Eder, H. (Battelle-Institut, Frankfurt am Main). Zentralbl. Veterinaermed., Reihe B, 12: 575-9(Dec. 1965). (In German).

Changes in lymphocyte counts were followed in rats up to 21 days following sublethal doses of whole-body ^{60}Co γ radiation. Adult male rats of the FW 49 strain received 300- or 600 rad doses, and levels of lymphocytes in lymph and arterial and venous blood were determined. Cell numbers in the intestinal lymph of rats changed in a similar degree and at a similar time as the lymphocyte numbers in the peripheral blood. There was no increase in the RNA content of the cytoplasm (demonstrated by acridine-orange fluorescence) of lymphocytes in blood or intestinal lymph after irradiation. The ratio of the number of lymph gland follicle lymphocytes and sinusoid lymphocytes in blood and intestinal lymph changes in favor of follicle lymphocytes after total body irradiation. These changes in the lymphocytes of the follicles and sinusoids of the lymph glands, distinguishable on the basis of nuclear form and number of nucleoli, indicate a more rapid depletion of the lymphocytes in the sinusoids than those in the lymph follicles. (BBB)

Radiation Effects Therapy and Countermeasures

35323 ELECTRON BEAM IRRADIATION OF BRAIN OF RAT AND DOSE-MODIFYING EFFECT OF ANOXIA. Sharples, N. A.; Jacobs, A. G. (St. Mary's Hospital Medical School, London). Acta Radiol. Therapy, Phys., Biol., 4: 161-76(June 1966).

The brains of rats were irradiated with 8-Mev electrons while the animals breathed 100% nitrogen before and during irradiation. No consistent degree of dose modification effect by nitrogen in the dose range 4,700 to 21,380 rad was found. The level of hypoxia necessary to achieve dose modification is thought to be too close to that which causes brain cell death by itself. The inability of the brain to regenerate functional neurons is probably another factor. (auth)

35324 RADIATION-INDUCED ADRENAL MEDULLARY TUMORS IN THE RAT. Warren, Shields; Grozdev, Ljubco; Gates, Olive; Chute, Rosanna N. (New England Deaconess Hospital, Boston. Harvard Univ., Boston). Contract AT(30-1)-901. Arch. Pathol., 82: 115-18(Aug. 1966). (NYO-901-52).

Seven hundred twenty pairs of parabiosed NEDH rats were studied as to the incidence and classification of adrenal medullary tumors. Parabiosis appears to protect from the spontaneous development of these tumors to some degree. Over 50% of male, irradiated, parabiont rats over 700 days of age developed adrenal medullary tumors. (auth)

35325 NEW INVESTIGATIONS ON THE WHOLE-BODY IRRADIATION AND GRAFTING OF BONE MARROW IN MAN. Mathe, Georges; Amiel, Jean-Louis (Hopital Paul-Brousse, Villejuif, France). Biol. Med. (Paris), 54: 455-65(July-Aug. 1965). (In French).

A bibliographic review is given of the most recent studies on bone marrow grafts in man. The applications of hematopoietic cell grafts for treatment by replacement of myeloid insufficiency states, treatment of some neoplastic illnesses, and establishment of a specific immunity tolerance bound to the chimerism with its application to tissue grafts and organ transplantation are discussed. The practical problems and difficulties of bone marrow grafts are discussed with respect to taking hematopoietic cell grafts and the secondary syndrome. (J.S.R.)

35326 EFFECT OF MONOETHANOLAMINE ON NUCLEIC ACID CONTENT OF IRRADIATED RAT ORGANS. Babina, E. Ya. (Erevan Veterinary Inst.). Biol. Zh. Arm., 19: No. 3, 49-52(Mar. 1966). (In Russian).

White rats were given an x-ray dose of 650 R, and a total of 200 mg of monoethanolamine per kg body weight was administered intraperitoneally. The RNA and DNA contents of the liver and spleen were determined 30 min and 2, 5, 7, and 10 days after the irradiation. The rats that were irradiated but given no monoethanolamine showed decreases in RNA and DNA contents of the liver and spleen at all periods after the irradiation. The rats protected with monoethanolamine showed an increased DNA content in the liver 30 min and on the 6th and 8th day after irradiation, and in the spleen at all periods after the irradiation. The maximum increase was a 90% increase in the spleen on the 3rd day after irradiation. A maximum RNA increase of 32% in the liver was observed on the 6th day after irradiation, and in the spleen a 46% maximum increase in RNA content was noted on the 8th day after irradiation. (TTT)

35327 INFLUENCE OF THYMECTOMY AND SUBSEQUENT THYMUS IMPLANTATION ON LEUKEMIA INDUCTION IN ADULT C57BL MICE BY RADIATION AND URETHAN. Berenblum, I.; Boiato-Chen, Louise; Trainin, N. (Weizmann Inst. of Science, Rehovoth, Israel). Cancer Res., 26: 1383-5(July 1966).

A single exposure of adult C57BL/6 mice to 400 R whole-body x-irradiation yielded 5% leukemia; thymectomy reduced the incidence to zero, while subsequent implantation of normal thymus reversed the process. Subsequent urethan treatment raised the incidence in nonthymectomized, irradiated mice to 34% and in thymectomized, irradiated, and thymus-implanted mice to 17%. When the thymus implant was given after instead of before the urethan treatment, the leukemia incidence remained low (4%). These results confirm in adults, what had previously been found in newborn mice, that thymus implantation cannot restore urethan leukemogenesis in thymectomized mice, as it does in the case of radiation leukemogenesis. (auth)

35328 EFFECT OF RADIATION PROTECTION AGENTS (ANOXIA, CYSTEAMINE AND CYSTAMINE) ON THE LEVEL OF SULFHYDRYL GROUPS IN ASCITIC EHRLICH CARCINOMA CELLS. Grayevskii, E. Ya.; Nekrasova, I. V.; Tarasenko, A. G. (Severtsov Inst. of Morphology of Animals, Academy of Sciences, SSSR). Dokl. Akad. Nauk SSSR, 166: 974-7(Feb. 1, 1966). (In Russian).

Studies were made on the hypothesis that radiation protection occurs not so much as a result of the presence of anoxia and aminothiols in the body, as of the general increase in the level of SH groups. To prove this point, attempts were made to show such an increase not only in the total living organism but in isolated cells as well. Experiments were performed on ascitic Ehrlich carcinoma cells after 7–8 days' cultivation. The sulfhydryl groups were determined in malignant cells and in the ascitic fluid of normal animals, in animals destroyed 10–15 min following anoxia, and in animals that were injected intraperitoneally with 5 g of cystamine 15 min prior to taking the ascites sample. In addition, sulfhydryl groups were determined in cells to which 0.6 mg/ml of cystamine and 0.4 mg/ml of cysteamine were added in vitro and incubated for 15 min at 37°C. It was found that under anoxia the thiol group content increased by 8% in air and by 18% in argon, while the content of the nonprotein sulfhydryl groups did not change. Cystamine caused a 12% increase of the SH groups in the malignant cells in vivo, and was completely ineffective in vitro. Cysteamine, added to the carcinoma cells in vitro. Cysteamine, added to the carcinoma cells in vitro, caused a 36% increase in SH groups, while the nonprotein SH group level increased sixfold. It was concluded that the protective effect occurs only in the case of an increase in the level of the protein sulfhydryl groups. This is explained by the inactivation of organic radicals formed during irradiation through interaction with the thiol groups. However, the possibility that the protection depends on the absolute content of SH groups and not on their reactivity is not excluded. (ATD)

35329 INFLUENCE OF ROYAL JELLY ON THE COURSE OF RADIATION SICKNESS IN WHITE RATS. Pejcev, P.; Bojadziev, S.; Marovski, T. (Inst. of Higher Medical Studies, Plovdiv, Bulgaria). Folia Med. (Plovdiv), 7: 69-73(1965). (In French).

The possible prophylactic and therapeutic effects of royal jelly on the radiation syndrome were tested in lethally irradiated rats. Previous studies have indicated that this product of the honey bee, when given to animals in small doses, may act as a central nervous system stimulant and enhance anabolic processes. Rats of both sexes, 3 to 4 months old, were given single, whole-body doses of 900 R of 200-kv x rays. The rats received royal jelly prophylactically, that is, daily for five days before irradiation, and therapeutically, or every day following irradiation. It was injected intramuscularly in doses of 0.10, 0.01, or 0.001 units/kg body weight. A moderate protective effect was seen with the intermediate dose (0.01 units/kg). This produced an average increase in survival time of the rats from 6.9 to 7.4 days. It also slightly inhibited the fall of body weight of the irradiated rats. With the other two dose levels, survival time and body weight changes were less favorable compared with controls. Drop in body weight seemed to be a grave prognostic sign in the course of radiation disease. Its course was similar in male and female rats. (BBB)

35330 PROTECTIVE ACTION OF RNA EXTRACTED FROM VARIOUS ORGANS ON THE HEMOPOIESIS OF IRRADIATED ANIMALS. Esposito, S.; Ligniere, E. L. Cherie; Pozzi, E. Haematologica (Pavia), 50: 711-22 (1965). (In Italian).

The radiation damage caused to hematopoiesis by radiations can be repaired by administration of RNA to the animals. The protective effect was obtained either by means of RNA from bone marrow, spleen, or lung. Treatment of the irradiated animals by RNA reduces the number of hematopoietic cells with chromosome damages and increases the percentage of repair of broken chromosomes. (auth)

35331 FACTORS INFLUENCING THE APPEARANCE OF SECONDARY ILLNESSES IN THE RAT. Dunjic, A. (Univ., Louvain, Belg.). J. Belge Radiol., 49: 96-102 (1966). (In French).

In irradiated rats following treatment with homologous bone marrow cells the appearance of delayed mortality between the 28th and the 112th day is conditioned by the degree of antigenic differences between the host and donor and by radiation dose delivered to the host. The delayed mortality rate is lower in the animals treated with 64×10^6 than in those receiving 32×10^6. The incidence of delayed mortality is not definitely affected by transplanting the homologous bone marrow cells between 3 and 72 hours after irradiation. (auth)

35332 DYSTONIA OF PULMONARY VESSELS IN RADIATION SICKNESS AND ITS PREVENTION WITH RADIOPROTECTIVE COMPOUNDS. Amosov, I. S. (Inst. of Medical Radiology, Academy of Medical Sciences, USSR). Med. Radiol., 11: No. 6, 44-50(June 1966). (In Russian).

By using angiographic procedures, studies were made on particularities of the pulmonary vessel circulation during radiation sickness, and special experiments were designed to do away with hemocirculatory disorders by prophylactic administration of some radioprotective agents (mercamine-ascorbinate and cystamine-hydrochloride). The drugs were found to have vasodilating effects on the pulmonary blood vessels in normal conditions and in radiation sickness.

Prophylactic administration of these preparations 10–20 minutes prior to irradiation abolished spastic manifestations and leveled out symptoms of circulatory dystonia in minor blood vessels, but did not preclude vascular hypotonia and a pathological stream of nonoxidized blood from pulmonary arteries to pulmonary veins through open arteriovenous anastomoses, bypassing the capillary stream. During convalescence and in remote periods the laboratory rabbits demonstrated dilation of the pulmonary artery and aorta. It is suggested that the protective effect of the preparations manifests itself not only on the cellular level, but is indirectly related to hypoxemia development due to circulatory dystomia of the pulmonary blood vessels and slowed down circulation. (auth)

35333 EFFECT OF HEMOLYSATES ON BLOOD CLOT RETRACTION IN ACUTE RADIATION SICKNESS. Ishmukhametova, D. N. (Inst. of Medical Radiology, Academy of Medical Sciences, USSR). Med. Radiol., 11: No. 6, 54-7(June 1966). (In Russian).

The mechanism of the effects of hemolysates of erythrocytes on blood clot retraction in rats with radiation sickness was studied. At the height of acute radiation sickness, thrombocytopenia, sharp changes in the thrombocytic formula, and qualitative alterations of fibrinogen, along with reduced fibrinase activity were observed. An addition of hemolysate to the whole blood of the animals, practiced at the height of acute radiation sickness, restored the blood clot retraction to its normal level, the possible reason for this being the presence in erythrocytes of the fibrinase responsible for the normal development of physiological fibrin. A minimum number of morphologically altered blood platelets, making their appearance at the height of an acute radiation sickness in the presence of hemolysate, proved sufficient for normal retraction of the blood clot. Consequently, the reduced blood clot retraction in acute radiation sickness is related not only to diminished numbers and morphological changes of blood platelets, but also to deranged structure and properties of fibrin. (P.C.H.)

35334 EFFECT OF TOTAL-BODY X-RAY IRRADIATION ON HISTOLOGICAL STRUCTURE OF SHIELDED SUPRARENALS. Molotkova, A. S. (Inst. of Experimental Endocrinology, Academy of Medical Sciences, USSR). Med. Radiol., 11: No. 6, 69-74(June 1966). (In Russian).

The effect of the shielded suprarenals on the histological structure of the organ and on the survival of animals exposed to an x-ray dose of 750 R were studied. Experiments were performed on 265 male-rats weighing 160–190 g. The suprarenals were protected by a special lead-capsule, which held back 70% of roentgen rays. The capsule was applied to the suprarenals immediately before irradiation of the animals and was removed right after its termination. Of 28 rats exposed to radiation with shielded suprarenals 40% survived over a period of one month; the identical survival rate was recorded in a group of rats, which, shortly before irradiation, were subjected to the same operation of the lead capsule application, later on removed, with the animals then being irradiated with unprotected suprarenals. All intact animals perished in a month's time. Following application of capsules to the suprarenals the latter had wedge-shaped forms of necroses developed therein, which extended mostly over the bundle and retinal areas, and were detectable in the suprarenals 3 hours after removal of the capsule. No difference was noted in the histological structure of the suprarenals of irradiated animals subjected to the operation of the capsule application, irrespective of whether the capsules were removed after irradiation or prior to it. (auth)

35335 THE EFFECTS OF AMINOETHYL ISOTHIURONIUM ON THE RADIOINDUCED CHANGES IN THE MIDBRAIN HYPOPHYSEAL SYSTEM OF THE RAT. Kuenkel, Hans A. (Univ., Hamburg). Naturwissenschaften, 53: 110(1966). (In German).

The effects of aminoethylisothiuronium (AET) on the radioinduced removal of neurosecretions from the posterior lobe was investigated in Wistar rats given AET 20 minutes before whole-body x irradiation with 1000 R. The animals were sacrificed 72 hrs later and the content of Gomori positive granules in the frontal layer through the hypophyseal posterior lobe was evaluated. The results showed that AET exerts a significant radioprotective effect against the radioinduced neurosecretion removal from the hypophyseal posterior lobe. The injection of AET alone without subsequent irradiation cause almost the same complete removal of the neurosecretion from the posterior lobe as whole-body irradiation with 1000 R. The origin of this protective effect was not determined. (J.S.R.)

35336 EFFECTS OF INHIBITORS OF FREE RADICAL PROCESSES IN IRRADIATED YEAST CELLS. Kozlov, Yu. P.; Gorin, A. I. (Moscow State Univ.). Nauch. Dokl. Vyssh. Shkoly, Biol. Nauk, No. 2, 91-3(1964). (In Russian).

Free radicals created by radiation are assumed to be responsible for the effects of radiation; a protective action is exerted by aqueous monomeric solutions which initiate polymerization reactions resulting in the ultimate removal of free radicals from the system. Propyl gallate (PG) and vinylpyrrolidone (VP), known inhibitors of free-radical reactions and radioprotective agents, were examined to verify the above assumption, exposing natural, diploid Saccharomyces vini yeast in suspension to 25, 37.5, 50, and 62.5 kR of γ radiation from a ^{60}Co source. The survival rate of the cells was determined, after treating the aqueous suspension of the cells with a solution of the radioprotective agent in the presence of atmospheric oxygen at 30°C, within 10 minutes after the exposure. The results showed that 0.5 to 3.0% PG solutions did exert a positive protective action, with a maximum at the 2% solution. Treatment before exposure to 37.5 kR also yielded positive results. The influence of VP solutions was even more marked, joint use of both solutions exerted an even stronger protective action. Electron paramagnetic resonance data pointed to the presence of free radicals in the live cells; treatment with the two solutions reduced the intensity of the signals without changing the nature of the spectra. (TTT)

35337 SENSITIVITY OF LEUKOCYTES TO RUBY LASER BEAM AFTER DIFFERENT VITAL STAINS. Bessis, M.; Storb, R. (Centre National de Transfusion Sanguine, Paris). Nouv. Rev. Franc. Hematol., 5: 459-74(May-June 1965). (In French).

Human leukocytes were prepared on Formvar films and stained vitally with various dyes applied in 1:1000 dilutions in saline. Fifteen to 30 min later they were irradiated with a ruby laser beam with a dia of 2.5 or 30 μ. Changes in the cells were examined by phase-contrast microcinematography and by electron microscopy. The dyes used included gentian violet, toluidine blue, Nile blue sulfate, Janus green B, brilliant cresyl blue, methylene blue, rhodamine B, neutral red, trypan blue, acridine orange NO, and auromine O. Such microirradiation allowed parts of cells or cellular organelles which had fixed vital stain to be destroyed. The concentration of dyes needed for visible staining was much greater than that needed to obtain an effect after laser irradiation. It is therefore possible to use doses of vital stains too small to be toxic. The existence of such infravisible staining suggests that heretofore unknown dyes might be discovered by laser irradiation. The action of laser radiation enables certain dyes to be recognized in areas of cells where their presence was previously unsuspected. With an adequate, but still vital concentration, it appears that the dyes fix themselves to all proteins. It is thus possible to sensitize the nucleus as a whole and even the hyaloplasm. (BBB)

35338 INVESTIGATIONS ON BIOLOGICAL RADIATION PROTECTION. PART 71. THE INFLUENCING OF RADIOIRON CLEARANCE FROM THE BLOOD BY IRRADIATION AND CHEMICAL PROTECTIVE SUBSTANCES. Koch, Ruprecht; Beisinghoff, Gundula (Univ., Freiburg i. B.). Strahlentherapie, 130: 296-304(June 1966). (In German).

Female NMRI mice were used to investigate the effects of whole-body irradiation with 30, 75, 150, 300, and 1,600 R on the ^{59}Fe clearance of blood plasma. The same studies were done after isolated irradiation of the head with 1,600 R. Preliminary results showed that 27.7% of the total blood

activity was incorporated into the erythrocytes 3 hours after intraperitoneal administration of ^{59}Fe. The threshold for decreased radioiron uptake after whole-body irradiation was found to be similar to the incorporation experiments at a dose of 30 R. The half life time, T/2, increased with increasing radiation doses. However, there seemed to be a limit between 75 and 150 R, at which further increase of T/2 could not be observed. After whole-body irradiations with 150, 300, and 1,600 R, no further change in the clearance rate could be observed. Chemical radiation protective substances, such as cysteamine, histamine, and serotonin, respectively, inhibited the radiation effect on ^{59}Fe clearance; all 3 substances showed the same dose-reduction factor of 2.5. Whole-body irradiation with 1,600 R caused a prolongation of T/2, while an isolated irradiation of the head with 1,600 R was completely ineffective upon the uptake. These results agree with previous observations that an isolated radiation exposure of the CNS with doses of up to 10,000 R do not influence the radioiron incorporation into the young erythrocyte populations. (auth)

35339 MITOTIC RESPONSE OF THYMUS-DERIVED CELLS TO ANTIGENIC STIMULUS. Davies, A. J. S.; Leuchars, E.; Wallis, V.; Koller, P. C. (Royal Cancer Hospital, London). Transplantation, 4: 438-51(July 1966).

A single thymus lobe from a neonatal donor was found to restore primary immunological competence to a thymectomized syngeneic radiation chimaera. If a cytologically marked thymus graft is used the fate of the introduced cells following antigenic stimulation may be studied. Thymus-derived cells were found in the spleen and lymph-nodes of such mice and furthermore there was a transient but well-defined increase in the proportion of these cells dividing following an injection of sheep red blood cells or application of a skin homograft 30 days after irradiation and thymus grafting. It was found that an even greater proportion of thymus-derived cells divide in response to a second challenge with sheep cells. Similarly, a higher percentage of thymus-derived cells divide in the lymph-nodes draining a second skin homograft. (auth)

35340 SOME NEW ASPECTS OF THE EFFECT OF EPSILON-AMINOCAPROIC ACID ON THE ORGANISM. Rudakova, S. F.; Zhukova, N. A.; Khnychev, S. S.; Susanyan, T. A.; Kozlova, I. I. (Inst. of Medical Radiology, Obninsk, USSR). Vest. Akad. Med. Nauk SSSR, No. 9, 74-7(1965). (In Russian).

The effects of epsilon-aminocaproic acid (EACA) on hemopoiesis in healthy and irradiated rats. The results showed that in healthy animals EACA stimulated leukopoiesis as indicated by the increased mitotic activity of the bone marrow and an increased number of leukocytes in the peripheral blood. This was confirmed by other results which showed an augmented granulocytic reserve of the bone marrow following EACA administration. As a therapeutic agent in irradiation EACA inhibited the development of anemia and contributed to a faster and more complete restoration of leukopoiesis. In addition it reduced the fibrinolytic activity of the blood in irradiated animals and normalized some indexes of the blood coagulation system. Finally, EACA increased survival of animals when administered prior to irradiation possibly by preliminary stimulation of leukopoiesis. (TCO)

35341 EFFECT OF ZYMOZAN ON THE MACROPHAGE RESPONSE OF THE LUNGS AND PHAGOCYTOSIS IN ACUTE RADIATION SICKNESS. Bykhovskii, A. V.; Komovnikov, G. S.; Polushkin, B. V. (Inst. of Medical Radiology, Obninsk, USSR). Vest. Akad. Med. Nauk SSSR, No. 9, 83-6(1965). (In Russian).

The effects of zymozan and various other substances on the number of alveolar macrophages and on the phagocytosis of micrococcus T-5 by the cellular elements of the lungs and blood in healthy and irradiated animals were studied. The experimental animals, mice and rats, were irradiated with 680 rad. In addition, the number of leukocytes in the peripheral blood as well as the serotonin levels in the blood and lungs were determined. Irradiation of rats resulted in a threefold increase of alveolar macrophages in 24 hours. Subsequently the number slowly decreased until after 21 days it was two times below normal. Intraperitoneal administration of zymozan either before or after irradiation did not produce any substantial changes in macrophage number. On the other hand, intraperitoneal administration of zymozan to the irradiated animals did produce a stimulation of bone-marrow function, leukocytosis, and in increase in the phagocytic activity of the peripheral blood. The digestive capacity of the alveolar macrophages of irradiated animals decreased 2½ fold after 9 days, while those of the animals treated with zymozan after irradiation showed a substantially higher digestive capacity. Analysis of results indicates that microbial polysaccharides may be used for the stimulation of defense mechanisms of the organism against infection during radiation sickness; they may induce the removal of radioactive and nonradioactive dusts from the lungs. (TCO)

35342 RADIOMETRIC STUDY OF PATHOGENESIS AND EXPERIMENTAL THERAPY OF INFLAMMATORY EDEMA. Oivin, I. A.; Kir'yakov, M. A.; Koroleva, L. V.; Romanovskaya, L. L.; Sveshnikov, A. A.; Tokarev, O. Yu.; Uklonskaya, L. I. (Inst. of Medical Radiology, Obninsk, USSR). Vest. Akad. Med. Nauk SSSR, No. 9, 87-93(1965). (In Russian).

A radioactive technique based upon continuous registration of beta-particle absorption was used for the study of exudation development, determination of the role of the adrenals and the central nervous system in the pathogenesis of exudation, and evaluation of some antiinflammatory agents. When xylene was applied to the ears of 30 rabbits for six consecutive days the inflammatory reaction gradually decreased with each application. The effect of adrenalectomy on the inflammatory response was studied in 70 rabbits; inflammation by the various agents was induced not earlier than 10 days after the operation. It was found that the inflammatory response provoked by xylene, heat, or beta irradiation developed slower and to a lesser degree in adrenalectomized than in normal animals. This effect can not be adequately explained at this time. The effect of chloral hydrate anesthesia on 11 adrenalectomized and 16 intact animals was studied using xylene as the inflammatory agent. In agreement with results of others it was found that anesthesia depresses the inflammatory response in adrenalectomized as well as normal animals. These results are interpreted as another indication of the involvement of the CNS in the pathogenesis of inflammation and disprove the previously held belief that anesthesia acts merely as a stress stimulator of the adrenals. The use of phlogodym in radioinduced inflammation depressed the inflammatory response as measured radiometrically. The beneficial effect of this compound was substantiated by clinical observations. (TCO)

35343 STUDIES ON RADIATION PROTECTION SUBSTANCES. Schmid, A.; Zipf, K.; Gutschow, K.; Schenkel, R. (Univ., Munich). Zentralb. Veterinaermed., 12: 571-4(Dec. 1965). (In German).

Radioprotective effects of rutin and escin were studied in 230 young rats exposed to doses of 330 rad of 60-kv x irradiation. The dose of rutin used was 25 mg/animal and the dose of escin used was 0.02 mg/100 g body wt. The chemicals were administered before and after irradiation in various combinations. Rutin, given once 10 min before irradiation did not affect the death rate. In male rats both substances were ineffective, but in female rats there was a slight protective effect, if given before irradiation. When the substances tested were given after irradiation they were ineffective or actually increased susceptibility of the animals to the irradiation. The effects of the chemicals tested were ascribed to changes in cell permeability that prevent loss of vital cell components caused by irradiation, if they are given before the irradiation. Thus, if these chemicals are given after irradiation, they may hinder recovery of physiologically normal conditions in cells. (BBB)

35344 IMMUNOLOGICAL REACTIVITY OF RADIOCHIMERA. IV. ADAPTIVE IMMUNITY. Kaulen, D. R. (Gamalin Inst. of Epidemiology and Microbiology, Moscow).

Zh. Mikrobiol. Epidemiol. Immunobiol., No. 5, 64-9(May 1966). (In Russian).

A study was made of the possibility of transmitting the resistance to diphtheria intoxication to guinea pigs irradiated with lethal doses by transplantation of bone marrow and splenic cells. Normal and immunized guinea pigs served as donors. As demonstrated, immune cells of the spleen provided a high degree of recipient's protection; their resistance depended both on the presence of antitoxin and also on the donor hemopoietic cells. The latter was confirmed by experiments in which the resistance of fatally irradiated animals was not only restored to the level of that in the normal guinea pigs, but also exceeded the latter as a result of transplantation of spleen cells from normal donors. A supposition is put forward on the direct relationship between the resistance of the animals to the toxin and the hemopoietic cell function. (auth)

Radiation Hazards and Protection

See also HEALTH AND SAFETY

35345 RADIOACTIVITY INVESTIGATION ON MEAT. Kreuzer, W.; Kotter, L. (Univ., Munich). Arch. Lebensmittelhyg., 16: 224-7(1965). (In German).

A method for the approximate determination of the ^{137}Cs value in meat is outlined. The method is distinguished by its simplicity and rapidity. It is recommended for determination of animal contamination because only muscle tissue is used in the sample instead of mixtures of many tissues and bones. (J.S.R.)

35346 PROTECTION AGAINST IONIZING RADIATION IN HOSPITALS. Lerch, P. Bull. Tech. Suisse Romande, 90: 85-92(Feb. 22, 1964). (In French).

After alluding briefly to the radiation hazards to which radiologists and their assistants are exposed, a general guide on radiation protection is given that includes: radiological units; maximum permissible doses; internal and external exposure; protection against contamination; protection against contamination; protection against external exposure; checking effectiveness of protective measures; and Swiss legislation on radiation protection. (Occup. Safety & Health Abstr., Vol. 3, No. 6, 1965)

35347 CALCULATION OF X-RAY RADIATION PROTECTION SCREENS. Binggeli, E. Bull. Tech. Suisse Romande, 90: 101-5(Mar. 7, 1964). (In French).

A method for calculating the protection afforded by screens against x radiation is described. A deep radiotherapy room in a clinic is used as an example. The factors taken into account are: technical characteristics of x-ray apparatus, tube voltage rating, load factor, utilization factor, maximum permissible dose, method, distance, and angle of radiation. The calculations are made both for direct and indirect radiation. In a second, shorter example, the case of a radiological institute located in a dwelling house is considered. (TCO)

35348 EVOLUTION OF THE BODY BURDEN IN ^{137}Cs FOR THE PERIOD MARCH 1962 TO FEBRUARY 1966. Jockey, Pierre; Ronteix, Claude; Durand, Francis (CEN, Gif-sur-Yvette, France). Compt. Rend., Ser. D, 262: 2565-8(June 13, 1966). (In French).

The evolution of the body burden of ^{137}Cs for the masculine population of the Saclay Center of Nuclear Studies during the period March, 1962 to February, 1966, was determined by statistical analysis of the results of γ spectrometry. The radioactive fallout connected with the nuclear tests of 1961 and 1962 produced a significant increase of the individual body burdens of ^{137}Cs. From 1962 to 1964 the activities increased on an average by a factor of 6. Since the beginning of 1965 the body burdens decreased with a period of about a year. The doses received by the organism in 1964 are less than 8 mrem. (tr-auth)

35349 DOSIMETRY OF FAST-NEUTRON RADIATION IN RADIOBIOLOGICAL INVESTIGATIONS. Deme, Sandor (Central Physical Research Inst., Budapest). Fiz. Szemle, 16: 173-8(1966). (In Hungarian).

Gamma and x radiations that induce low specific ionization and neutron radiation inducing a high ionization cause identical physical effects in target systems, even though the physical dose rate differs markedly. The equivalent dose rate is strongly dependent on the target and the nature of the effect under study. The linear energy transfer (LET) is an excellent indicator for the comparison of the biological effectiveness of various types of radiations. The oxygen effect was found to be much smaller in fast-neutron radiations than in radiations with a low LET value. Reactors are the largest and most useful fast-neutron radiation sources for biological studies; the neutron yield of radioactive sources is too low for radiation biological studies. The composition of the tissue being studied must be known; for dosimetric investigations phantoms may be used. In the energy range from 0.1 to 14 Mev elastic collisions play the chief role. Ionization chambers are very suitable for dose measurements, but care must be taken that the wall and filling gas have a composition similar to the atomic composition of the irradiated tissue. Such a chamber is not useful for differentiating between neutron and x radiations. Film, solid-state, thermoluminescence and radiophotoluminsecence dosimeters exhibit low sensitivity toward fast neutrons. Threshold detectors of S, P, Mg and In are widely used; however, none of the fast-neutron techniques are as convenient and precise as the methods used in x-ray or γ dosimetry. (TTT)

35350 SECONDARY-PARTICLE CONTRIBUTION TO THE DOSE FROM SOLAR-FLARE PROTONS INCIDENT ISOTROPICALLY ON SLAB SHIELDS. Irving, D. C.; Alsmiller, R. G. Jr.; Alsmiller, F. S.; Moran, H. S. Nucl. Sci. Eng., 25: 373-6(1966).

Dose as a function of depth in tissue was calculated for the case of solar-flare protons incident isotropically on slab shields followed by tissue slabs. The flare used has a spectrum that is exponential in rigidity with a characteristic rigidity P_0 of 80 Mv. Only incident protons with energies between 0 and 400 Mev are considered. Slab thicknesses of 4 and 20 g/cm^2 of aluminum are considered and a tissue thickness of 30 cm is used. In general, it is found that the secondary contribution to the dose is small unless thick shields are considered. In particular, the secondary neutrons from flare protons with energy of less than 50 Mev do not contribute appreciably to the dose in the cases considered. (auth)

35351 EQUIPMENT FOR PROTECTION AGAINST RADIATION. Muta, Nobuyoshi. Rinsho Hoshasen, 9: 745-7(Sept. 1964). (In Japanese).

Some equipment for protection against some of the occupational hazards of radiation was designed and constructed. A working table was designed in which a 10-cm-thick, L-shaped, lead block was used for the front and bottom of the table and a lead plate 5 cm thick and 25 × 15 cm^2 was placed on both sides. The hands of the operator can reach the table through a small door. A mirror can be used to help observe the operations during experiments. A small carriage for transportation of radioactive materials was also designed. It consisted of a lead sphere, with a hole in the center, mounted on two wheels with a long (150 cm) handle. The upper portion of the sphere functioned as a lid, which could be removed, allowing access to the 2 × 4 cm compartment in the center of the sphere. The third protective device which is described and illustrated is a 5 × 40 × 50 cm lead shield mounted on a tripod. This can be used at the bedside of patients having implanted γ radiation sources. (BBB)

35352 DETERMINATION OF ^{90}Sr IN MILK BY MEASUREMENT OF ^{90}Y BEFORE THE DEVELOPMENT OF ^{90}Sr–^{90}Y EQUILIBRIUM (A SLIDE-RULE METHOD). Giese, W. (Tieraerztliche Hochschule, Hanover). Zentralbl. Veterinaermed., Reihe B, 12: 622-8(Dec. 1965). (In German).

Various means of estimating fallout levels of ^{90}Sr in food-stuffs are discussed, and a method is described in detail along with nomograms and a slide rule to facilitate the calculations. Determination of ^{90}Sr in milk and other biological material can be carried out with great accuracy

by measuring the daughter isotope ^{90}Y. The method of waiting for $^{90}Sr-^{90}Y$ equilibrium to make measurements is, however, time consuming (two weeks' delay) and can be so modified that by considering the exponential rise of ^{90}Y from the formula $A = \alpha(1 - e^{-\lambda \cdot t})$ each level of ^{90}Sr can be calculated from the ^{90}Y value measured before equilibrium occurs. The formula is: $\alpha(^{90}Sr) = A$ (measured ^{90}Y on day $t)/(1 - e^{-\lambda \cdot t})$, where α is the number of ^{90}Y disintegrations at equilibrium and λ is its decay constant. If one calculates at first the denominator for the number of days t as equal to 1–20, one has 20 factors which can be marked on a slide rule. For example, a value for ^{90}Y measured on the seventh day only needs to be divided by the factor calculated for the seventh day to give an exact value for the ^{90}Sr present. Examples of the calculations are given, and relations between milk/plasma levels of ^{90}Sr and concentrations in bone are explained. (BBB)

Radiotherapy and Radiodiagnosis

Refer also to abstracts 35214 and 35976.

35353 CLINICAL WHOLE-BODY COUNTING: WHOLE-BODY SCANNER WITH TWO CRYSTALS. Reizenstein, Peter; Karlsson, Hans Ake (Karolinska Sjukhuset, Stockholm). Acta Radiol. Therapy, Phys., Biol., 4: 209-20 (June 1966).

The background shield and two-crystal scanning detector of a clinical whole-body counter are described, and differences in the requirements of biophysical and clinical counters are discussed. (auth)

35354 ELECTROMYOGRAPHIC CHANGES FOLLOWING ROENTGEN TREATMENT OF THE PAINFUL SHOULDER SYNDROME. Hakansson, C. H.; Moritz, U. (Univ. of Lund Hospital, Sweden). Acta Radiol. Therapy, Phys., Biol., 4: 221-32(June 1966).

Twenty-six patients with the painful shoulder syndrome were investigated by electromyography of the deltoid muscles. Most of the patients had signs on the affected side generally considered to be manifestations of myositis. Roentgen treatment produced an improvement in the electromyographic pattern accompanied by a corresponding improvement in the clinical condition. (auth)

35355 ORGANIZATION OF CLINICAL DOSIMETRY. I. THE FOUR STAGES OF CLINICAL DOSIMETRY. Cohen, Montague (IAEA, Vienna). Acta Radiol. Therapy, Phys., Biol., 4: 233-56(June 1966).

A review is presented of the procedures whereby an irradiation treatment is planned and delivered to an individual patient, and the value of the tumor dose assessed. Four stages may be distinguished in clinical dosimetry: topography, planning, treatment, and reconsideration. These stages are discussed, in relation to teletherapy, with the aid of tables and a block diagram. Emphasis is laid on individual correction procedures for body shape and composition, by calculation, by in vivo measurement, or by measurement of transit doses. The possible role of automatic computers in clinical dosimetry is also discussed. (auth)

35356 CONSIDERATIONS ON THE ASSOCIATION OF CHEMOTHERAPY AND RADIOTHERAPY. Chevallier, A. Biol. Med. (Paris), 54: 415-27(July-Aug. 1965). (In French).

The principal data available in the literature on the association of chemotherapy and radiotherapy are reviewed. The principal theories and models describing such associations are outlined. Experimental data on the efficiency of associated chemotherapy and radiotherapy are reported using x rays for the radiation and cyclophosphamide as the chemical agent. The evolution of the number of medullary cells 24 hrs after the separate or combined action of these agents was followed in rats up to complete restoration or up to the return to a ratio of 1.9×10^6 cells/mg of bone marrow. The results showed that there is no phenomenon of potentialization in the combined use of the two agents. The cellular biological action of the radiomimetic agent has very different characteristics from that of the x rays. The additive effects can be more or less marked according to the ratio of the respective doses of the two agents in the presence of each other and according to the moment of their administration. The fact that no phenomenon of potentialization occurs seems to show that the mechanism is not one of sensitization. The data available can be explained by assuming that each of the agents acts with its own characteristics. (J.S.R.)

35357 USE OF A SIMPLE WHOLE-BODY COUNTER FOR HEMATOLOGICAL INVESTIGATIONS. Callender, Sheila T.; Witts, L. J.; Warner, G. T.; Oliver, R. (Churchill Hospital, Oxford). Brit. J. Haematol., 12: 276-82 (May 1966).

A whole-body counting system is described, in which two 10 cm sodium iodide crystals are mounted, one above and the other below a motorized couch. Collimators restrict the field viewed to some 38 cm along the couch and further lead protection prevents direct background radiation from reaching the detectors. The total weight is about 4½ tons so that installation in a normal hospital laboratory is possible. The traverse count obtained as the patient passes between the detectors is essentially independent of the localization of the radioactivity within the body and the equipment is now in routine use for clinical measurement of uptake of ^{58}Co and ^{59}Fe. The average ratio of body retention determined by the whole-body counter and by measurement of fecal samples was 1.01 ± 0.12 so that there is no systematic difference in the results. The avoidance of the inconvenience and uncertainty associated with fecal collections is of great value in clinical practice. (auth)

35358 HISTOCHEMICAL STUDY OF THE EFFECTS OF ^{60}Co SHORT-DISTANCE IRRADIATION ON THE CANCER OF UTERINE CERVIX. Udagawa, Toshiji (Chiba Univ., Japan). Chiba-Ken Igakkai Zasshi, 41: 13-31 (May 1965). (In Japanese).

Cobalt-60 short-distance irradiation (1000mC hr, 4 times every other day, 4000mC hr total) was given to cancers of the uterine cervix, and probe resection of cancer tissues was performed six times before, during, and after the irradiation in each of 38 cases. On the resected cancer tissues, 29 kinds of metabolites and enzyme activities were histochemically investigated and the morphological changes were also studied together with these fluctuations. In the irradiated cancer cells, nucleolus RNA, glycogen, and lipids increased remarkably; and DNA, protein binding SH-radicals, vitamin B_1, isocitrate dehydrogenase, malate dehydrogenase, NAD(DPN)-diaphorase, and esterase decreased considerably or diminished in activity. The increase of nucleolus RNA and the appearance of coarse granules containing cytoplasma RNA, glycogen, and lipids, respectively, were related to the degeneration of cancer cells. In the cancer stroma loosened by the irradiation, α-amino-radicals, lipids, ribonucleotidase and phosphoamidase increased or tended to augment in activity; vitamin B_1, isocitrate dehydrogenase, malate dehydrogenase, and NAD(DPN)-diaphorase decreased or tended to diminish in activity. In the connective tissue in which the tendency of proliferation was morphologically observed, the augmentation in activity of 5′-nucleotidase and adenosine triphosphatase was observed. Further, the wandering cells having enzyme activity like histiocytes appeared with degeneration of cancer cells. (auth)

35359 STRAIGHT TALK ABOUT CHEST X-RAY. Dis. Chest, 49: 190(Jan. 1966).

Recommendations of this Committee are stated, after a brief survey of the possible hazards of routine chest x rays for patients being admitted to hospital. It is noted that hysteria concerning the use of x rays in medicine persists. Some physicians and many patients are still reluctant to obtain needed x-ray examinations. The desirability of routine hospital admission chest films is occasionally questioned. When chest films are done well, there is practically no demonstrable gonadal dose. It is suggested that a woman could have six chest films properly exposed every day of her life to age 30 and a man have one, and each would re-

ceive only a small increase in gonad dose over natural background. The Joint Committee on Chest X-ray of The American College of Radiology and The American College of Chest Physicians, recognizing that the diagnostic yield of routine hospital admission chest films in adults is still high, especially in metropolitan areas and that the danger from the irradiation is negligible, recommends continuation of this procedure where it is now done and initiation of the procedure where it is not now done. The need for all radiological procedures must be judged on the basis of the value to be gained for the patient. Any physician using radiation on his patients has the obligation to train himself and his personnel to use radiation safely and to obtain the maximum benefit from the radiologic procedure. The risk of harm from diagnostic radiation is certainly not greater than hazards from other medical procedures. In fact, many medical and most surgical diagnostic and therapeutic procedures carry considerable risk by comparison. The health needs of the patient must outweigh the possibility of hazard in using radiation, as in any other procedure in medicine. (BBB)

35360 CONDITION OF THE URINARY TRACT IN THE EARLY FOLLOW-UP PERIOD IN CASES OF RADIUM-TREATED CANCER OF THE UTERINE CERVIX. Gulanowska, Helena; Broniecka, Halina; Lotocki, Wiktor; Dzieszko, Waclaw (Academy of Medicine, Bialymstoku, Poland). Ginecol. Pol., 36: 197-204(Feb. 1965). (In Polish).

Effects of γ radiation from intracavitary implanted Ra on the urinary tract were examined in 100 cases of uterine cervical cancer at an early period after radiotherapy. The patients were divided into four groups according to the degree of neoplastic invasion. Clinical evaluation of the state of the urinary tract was performed through interviews, stress test (cough tests), sphincterо- and cytometric procedures, cystoscopy, chromocystoscopy, and urography. The lower portion of the urinary tract showed an increase of inflammatory state of the urinary bladder mucosa from 46 to 72%, an increase of the tonometric index in 65% of cases, and diminution of urinary bladder volume in 24% of cases, and urinary fistula in 1% of the cases. In the upper portion of the urinary tract, before the induction of therapeutic measures, urinary stasis was detected in 18 cases, 3 of them showing unilateral urographic changes. After radiotherapy, the urinary stasis symptoms disappeared in 13% of cases, but in addition to the remaining 5 cases of urinary stasis, 12 other cases developed in the course of radiotherapy. It is concluded that use of radiotherapeutic measures in cases of uterine cervical cancer leads to various changes in the urinary tract. The changes may induce subjective complaints only, or may lead to severe, irreversible changes involving the urinary bladder and the upper urinary tract. Such disorders induced in the urinary tract may conceal the existence of recurrent cancer. (BBB)

35361 CORRECTIONS FOR INHERENT TIMING ERRORS IN IRRADIATIONS. Randolph, M. L.; Hosszu, J. L. (Oak Ridge National Lab., Tenn.). Health Phys., 12: 971-3(July 1966). (ORNL-P-1471).

A simple and accurate technique is described for the detection of timing errors inherent in many measurements of radiation exposure. Results obtained in the calibration of an x-ray deep therapy machine are discussed. (C.H.)

35362 SPLEEN-FUNCTION STUDY WITH 2-MERCURI-2-HYDROXYPROPANE LABELED WITH ^{197}Hg. Wang, Yen; Westerman, Maxwell P.; Heinle, Edward H. (Presbyterian-Univ. Hospital, Pittsburgh). J. Amer. Med. Ass., 194: 1254-6(Dec. 13, 1965).

A new compound, 1-mercuri-2-hydroxypropane (MHP) labeled with radiomercury (^{197}Hg), for spleen scanning has been introduced. Radioactive-MHP erythrocytes reach peak activity in the spleen one to three hours after injection. This activity begins to fall rapidly four to six hours after injection. As a result, the functional state of the spleen or the degree of erythrocytic sequestration can be evaluated at the same time that the scan is done. Using the radioactive-MHP procedure, the erythrocytic sequestration study can be accomplished in three to four hours, while it would take at least a week by the ^{51}Cr-tagged erythrocyte method. In the procedure for spleen scanning, 20 to 200 μC of radioactive MHP (0.5 to 3.5 mg) of MHP in a heparinized syringe is added to 2 ml of the patient's venous blood. The mixture is incubated at room temperature for at least three to five minutes, then injected into the patient. By means of a 19-hole focusing collimator, the spleen, liver, and heart are counted every 30 min for the first two hours and then hourly for two additional hours. Usually the spleen count is at its max at 90 to 120 min. A repeat study, if necessary, can be performed three to four days later due to the short half-life of ^{197}Hg and the rapid disappearance of MHP from the spleen after four to six hours. The ^{197}Hg has a physical half-life of 65 hr and an energy level of 77 kev. Radioactive chromate (^{51}Cr) with a physical life of 27.8 days emits γ radiation at 322 kev. The radiation dose is reduced from several rad with 100 μC of ^{51}Cr to less than one rad with 100 μC of radioactive MHP. (TCO)

35363 PREOPERATIVE RADIOTHERAPY IN CANCER. Nickson, James J.; Glicksman, Arvin S. (Memorial Hospital for Cancer and Allied Diseases, New York). J. Amer. Med. Ass., 195: 922-6(Mar. 14, 1966).

This review cites some of the advantages and disadvantages of radiotherapy prior to surgery for cancer. Data are first examined wherein a full dose of radiation was used, which means treatment to tolerance of the normal tissue. The time-dose relation is tabulated for various body sites. A common range was 6000 rad in five to six weeks. If megavoltage radiation was used, postoperative wound complications were reported to be diminished. Competent surgeons had little if any more postoperative morbidity with radiation than without. It was found that following irradiation the volume of the primary cancer was reduced so that the volume of tissue excised was often smaller and the chances of cure improved. Use of a moderate dose of radiation, defined as doses of 2000 to 3000 rad in one to three weeks, has its origin in pre-megavoltage days of radiotherapy when large doses of irradiation to large torso fields carried considerable risk. This survey indicates that combined radiation and surgery should not be considered if the patient has distant metastases or has a very small primary tumor with no regional node involvement. The optimal situation for combined treatment to be effective is for the patient with neither a very high nor a very low probability of survival. In the former instance it is not necessary; in the latter it is insufficient. Radiobiological models which have been proposed to explain cell injury and death from ionizing radiation are discussed. The model of cell injury as it currently stands states that the fewer the fractions, the more effective a given dose will be. For bulky primary tumors or for regional nodes, with the exception of carcinoma of the cervix, high-dose irradiation alone has little chance of achieving its objective. Surgery alone also fails when used as the sole method for curative management in these patients. The common idea that full doses of radiation are inevitably followed by sharp increase in operative morbidity is disproved by many observations. It is stressed that this is true if, and only if, highly skilled radiotherapists and surgeons work closely together in executing combined treatment. (TCO)

35364 RADIOLOGICAL EXAMINATIONS AND REVISION OF THEIR INDICATION WITH REGARD TO ENDANGERING THE GONADS. I. MEASUREMENTS OF THE GONADAL DOSE. Hrabovszky, Zoltan; Nikl, Istvan (Frederic Joliot-Curie Sugarbiologiai Kutato Intezet, Budapest). Magyar Radiol., 16: 65-89(Apr. 1964). (In Hungarian).

An extensive review is given of the known sources of natural radiation and radiation from fallout and the associated dangers. Maximum permissible doses are given regarding fallout and background radiation. Special attention is focused on radiation received for medical reasons and the possible genetic damage which may result is discussed. Extensive dose measurements were made on live subjects, as opposed to phantom or cadaver measurements, and these are compared to those published by other authors.

The measured radiation doses to the gonads are given for a wide variety of routine x-ray examinations, including men and women of various ages, with and without shielding. Particular attention is drawn to protection problems in x-ray examination of children. Extensive comparisons are presented among published figures of other authors and these are discussed. It is pointed out that further precautions are necessary to reduce gonadal exposure in the general population. (TCO)

35365 TECHNIQUE AND INDICATIONS OF THE SUPERVOLT THERAPY OF THE CARCINOMA OF THE MAMMAE. Becker, J. (Czerny Krankenhaus, Heidelberg). Magyar Radiol., 17: 321-30(Dec. 1965). (In Hungarian).

The advantages of pre-operative and postoperative supervoltage therapy for breast carcinoma are discussed. Skin reactions have been negligible and damage to the deeper tissues has been reduced, while a greater dose is delivered to the primary tumor and the supra- and intraclavicular and axillary lymph nodes. This method saves time, as a greater dose can be delivered at one session. A pendulum-type arrangement of the irradiation equipment that delivers a more even dose over the required area is illustrated. The results of postoperative treatment on 383 patients were recorded, some having received single-field irradiation and others pendulum treatment. The individual doses are 250-R skin dose and a total 4000 R during two and a half to 5 weeks. Epitheliolysis was noted in some cases. The supraclavicular and axillary areas were irradiated by directing the beam over the anterior-posterior axis of the body at an angle and directly to the axillary area. The fields were 12–14 × 6 cm at 50-cm focal distance. The total dose delivered was 5000 R in 300 R fractions during 3 to 6 weeks. It was found with this method that there is less lung and shoulder-joint damage. Long-range results are not available, but primary results indicate that there will be few local recurrences. Inoperable tumors have been successfully treated by this method, the doses depending on the condition of the patient. When it was applied to slowly developing scirrhous carcinomas occurring in older women, regression occurred to the point where recovery could be considered complete as the life expectancy of the patient was not influenced by the carcinoma. The doses in these cases were 5000 R in 250- to 300-R daily fractions. (TCO)

35366 COMBINED SURGICAL TREATMENT AND SINGLE RADIATION TREATMENT WITH HIGH DOSE IN THE THERAPY OF THE CARCINOMA OF THE BLADDER. Mustakallio, S.; Leppaenen, M. K. (Univ. of Helsinki). Magyar Radiol., 17: 351-5(Dec. 1965). (In Hungarian).

As the usual surgical and irradiation methods produce only poor results in carcinoma of the bladder, and five-yr survival is obtained in only about 25% of the cases, a new, more effective method was tried at this clinic. The patients chosen for the treatment were those in whom the malignancy had not invaded the wall of the bladder. The abdominal cavity and the bladder were opened under anesthesia, the outline and the depth of the tumor were determined and marked. Then the necessary radiation dose was calculated, and the patient was treated with 250-kv x rays. To protect the area adjacent the bladder, a 3-mm lead shield was placed intraperitoneally behind the bladder. The dose was then delivered at 175 R/min in a single session and ranged from 2000 to 4000 R measured at the surface of the tumor. If the tumor did not disappear after the first treatment, the procedure was repeated after six weeks. More advanced cases received telecobalt therapy in addition to the above procedure. Thirty-three patients were treated with this method within two years. Due to the short time elapsed, results are only preliminary, but show that the tumor disappeared in 21 cases, in 9 cases there was no change in the tumor size; of these, 6 patients died and three died immediately following the operation. Two other patients died of other causes. One patient developed perforation of the jejunum six months after the second irradiation therapy, but had no complaints immediately following the operation. There was a mild radiation reaction in the colon in five cases. It is thought that this method gives good results even in stage IV cases and it is further felt that it might be applied to carcinoma of the stomach, pancreas, lung, and the retroperitoneal organs. (BBB)

35367 OPTIMAL ENERGY OF INCIDENT NEUTRONS IN NEUTRON-CAPTURE THERAPY. Ryabukhin, Yu. S. (Inst. of Medical Radiology, Academy of Medical Sciences, USSR). Med. Radiol., 11: No. 6, 9-13(June 1966). (In Russian).

Optimal energies of the monochromatic neutron bundles, utilized in neutron-capture therapy, are calculated in the first approximation. The optimal energy was found to rise from ~100 ev, with a depth of 2 cm, up to ~2.5 Mev, with a depth of 15 cm. The curves obtained are helpful in readily evaluating the minimum required concentration of a given isotope in the tumor at its given depth. (P.C.H.)

35368 IMMEDIATE PROSPECTS FOR THE USE OF THE RADIOISOTOPE DIAGNOSIS IN THE CLINICAL STUDY OF INTERNAL DISEASES. Fateeva, M. N. Med. Radiol., 11: No. 6, 13-18(June 1966). (In Russian).

Methods for the radiodiagnosis of internal diseases in man that are seldom used are reviewed. These include the use of organic compounds labeled with ^{58}Co, ^{131}I, and ^{14}C for diagnosis in the liver, heart, kidneys, thyroid, and gastrointestinal tract. The use of labeled enzymes is also discussed. (P.C.H.)

35369 POSSIBILITIES AND RISKS OF RADIOACTIVE ISOTOPE THERAPY. Ephraim, K. H. Ned. Tijdschr. Geneesk., 108: 1758-70(Sept. 12, 1964). (In Dutch).

For the benefit of the layman, the possibilities and risks of radioisotope therapy are reviewed. Treatment of hyperthyroidism, thyroid gland carcinomas, and heart diseases with radioactive iodine, therapeutic uses of radioactive colloids, intracavity therapy with ^{32}P and ^{90}Y, intravascular use of ^{198}Au, treatment of systemic illnesses with radioisotopes, and treatment of chronic leukemia with radioisotopes are discussed. (J.S.R.)

35370 USE OF RADIOACTIVE ISOTOPES IN CLINICAL PATHOLOGY. Tauxe, Welby Newlon (Mayo Clinic, Rochester, Minn.). New Physician, 13: 230-2(July 1964).

This review considers some new development in the use of radioisotopes in the clinical lab, and discusses some of the possible future trends in this field. New developments are discussed in terms of three categories: (1) strictly in vitro tests, in which one adds radioactive reagents to some body fluid; (2) in vivo-in vitro tests, in which one administers some radioactive indicator to the patient and then collects some body fluid or excretion for analysis; and (3) strictly in vivo tests in which one actually quantitates radioactivity emanating from the patient himself. The role of radioisotopes now is important, but their use in medicine is still on the threshold. For example, there are less than 50 whole body counters in the United States at present, and not all of these are in medical use. The medical applications of such counters, however, are important, and their use will probably become much more widespread. For example, the natural radioactive potassium (^{40}K; half-life, 1.3 billion years) may be quantitated by this method, and the total body potassium calculated in a short time by counting the entire human body. The high sensitivity of whole-body counters makes them useful for extending present metabolic turnover studies of exogenous radioactivity many half-lives beyond that possible at present. It will be possible also to monitor externally any unintentionally ingested radioactivity, such as that ingested by radium dial painters, and from thorium contrast media, fallout, and other sources. (BBB)

35371 RADIOISOTOPE LOCALIZATION OF THE PLACENTA BY POLAROID COLOR SCANNING. Krohn, Leon; Jaffe, Henry L.; Adams, Ralph (Cedars of Lebanon Hospital, Los Angeles). Obstet. Gynecol., 27: 185-93 (Feb. 1966).

The use of radioisotopes, specifically ^{131}I-human serum albumin (RISA), is believed to be superior to radiographic methods and to offer a more satisfactory placental localiza-

tion. Isotopic localization of the placenta is superior to x-ray placentography because there is less radiation exposure to both mother and fetus. Previous techniques for radioisotope localization of the placenta have involved point-to-point hand counting. The usual 10-μC dose of ^{131}I is diluted to about 0.002 μC/ml blood. This extremely low concentration required correspondingly coarser collimation for adequate counting statistics. Because placental scanning does not demand the degree of spatial resolution needed in other organ scanning procedures, it was possible to employ very coarse collimation so that the field observed was the size of a baseball. Accordingly, two 7-port coarse collimators for 3-in. and 5-in. detectors were built. The counting rates over the placenta about 15–20 min after the injection of 10 μC of ^{131}I-tagged serum albumin into the maternal vein were about 1000/min with the 3-in. detector, and 2000/min with the 5-in. detector. The authors designed and built a new accessory attachment for use with any conventional scanner for the recording of scans in Polaroid color. By use of this instrument the image which is displayed on the screen of a cathode ray tube is photographed in color during a time exposure through a series of 10 colored filters. These color filters are driven by a servomechanism operated from the ratemeter of the scanner. The servomechanism is calibrated so that the max counting rates appear in red, and the decreasing rates photograph through the spectral sequence of colors to violet at background level. This produced a color scan of the placenta in both the anteroposterior and lateral views by automatic scanning. This method of placenta localization was carried out in 31 patients with no untoward reactions in mother or fetus. The accuracy of this method was confirmed. The amount of ionizing radiation to both mother and fetus is below the level of radiation exposure previously encountered in other diagnostic methods. (TCO)

35372 SOME PROPERTIES OF SIX DIFFERENT TYPES OF DENTAL X-RAY UNIT. Trouerbach, W. Th.; van Aken, J. (Utrecht Univ.). Oral Surg., Oral Med., Oral Pathol., 20: 743-54(Dec. 1965).

In view of the importance of radiation hygiene, which implies accurate dose measurement in dental radiography, 45 x-ray machines of six different types were examined with respect to reliability of timers and output. To measure exposure time, an apparatus was used which permitted the registration of 20 exposures on one film. The film was placed on a turntable, which was mounted in a box with lead cover. A small movable opening in the cover was used to expose the film. For each exposure setting, this opening was placed at a different distance from the center of rotation. In this way, the black spots on the film were recorded in concentric circles. The setting of the time is referred to as the exposure setting and the time that the film is actually exposed is called the time of exposure. The ratio of these two values (time of exposure/exposure setting) is taken as the error in exposure. It was observed that the error between the machines (S_b) was always larger than the error within the machines (S_w), although the differences varied considerably. Some machines required better timers when newer, faster, x-ray films were used. In general, it is concluded that mechanical timers cannot be used for exposures shorter than a few tenths of a second. A good electronic timer or a synchronous motor-operated timer is recommended for the shorter exposure times. When the output per second was determined graphically, it was observed that the error within the machines was very small for all of the different types tested. The errors between the machines, however, were large. In addition to the large range that was found, one series of identical machines could be subdivided into two categories having a large difference in output. After inspecting this type machine, it was observed that the three machines with reduced output had an additional nonremovable aluminum filter. (TCO)

35373 CARCINOMA OF THE RECTUM FOLLOWING IRRADIATION OF CARCINOMA OF THE CERVIX. Smith, Joe C. (London Univ.). Proc. Roy. Soc. Med., 55: 701-2 (Aug. 1962).

Three case histories are reported for patients who developed rectal cancer after x-ray and Ra therapy for uterine cancer. The first patient was treated for squamous cell carcinoma of the cervix by radium, totaling 6667 mg-hr and deep x-ray therapy totaling 2400 R. Nineteen years later, a polypoid mass 2 cm from the anal margin showed an adenocarcinoma. Case 2 had a squamous cell carcinoma of the cervix invading the right parametrium and was treated by radium totaling 4900 mg-hr and deep x-ray therapy totaling 4000 R. Twenty-two years later she was found to have an annular carcinoma of the rectum about 5 cm from the anus. Case 3, with squamous cell carcinoma of the cervix, was treated by radium totaling 8100 mg-hr and deep x-ray therapy totaling 1220 R. Nineteen years later she had a vesicovaginal fistula and an ulcer on the anterior wall of the rectum, which proved to be an adenocarcinoma. Thus, in all three cases a primary tumor of the rectum occurred about 20 years after irradiation of a carcinoma of the cervix. It is important to differentiate between a second primary tumor and a late recurrence of the original tumor. In the three cases described, the initial tumor was a squamous cell carcinoma and the subsequent one an adenocarcinoma. Histologically, these are separate primary tumors. In all three patients perirectal induration was noted and in two it was thought to be due to extension of the carcinoma, their long survival making this improbable. It is difficult to be certain that these rectal tumors were related to irradiation. (TCO)

35374 POLYCYTHEMIA VERA: CLINICAL STUDIES ON A SERIES OF 127 PATIENTS MANAGED WITHOUT RADIATION THERAPY. Perkins, J.; Israels, M. C. G.; Wilkinson, John F. (Univ. of Manchester, Eng.). Quart. J. Med., 33: 499 518(Oct. 1964).

There are three main reservations about radiotherapy for polycythemia: the general objection to giving radioactive substances in effective doses, especially to younger patients, when the natural prognosis is likely to be several years; the suspicion that in polycythemia the treatment could transform the condition to an acute or chronic leukemia; and the risk of producing unremitting pancytopenia or aplastic anemia. Another difficulty is the high failure rate where there is a marked leukocytosis, splenomegaly, or leukemoid reaction. A proper evaluation of the problem has been hampered by the lack of a large series of nonirradiated patients where survival matches that of irradiated patients; so to study this problem, 127 polycythemic patients were treated by methods other than those using radiation. No case of acute leukemia occurred in this series whereas acute leukemia accounts for more than 10% of the deaths of irradiated patients. It is shown that the leukemoid reaction in polycythemia can be distinguished from the superficially similar picture of chronic myeloid leukemia. Anemia was a common problem frequently arising as a result of therapy, but megaloblastic anemia not due to therapy was more frequent than expected. The combination of venesection with myelosuppressive drugs is recommended as the treatment of choice for polycythemia vera. The prognosis is expressed as a ratio of observed and expected number of deaths. The expected number of deaths refers to the number of deaths expected for a group of the general population with the same age and sex distribution as the polycythemia patients and who lived in the same years as the patients. From the date of onset of the disease this ratio was 2.4 and for x-irradiated patients it was 2.3. From the date of diagnosis and commencement of treatment this ratio was 2.9 for the nonirradiated patients and 2.4 for the irradiated patients. No significant difference in survival was seen in these two groups. (TCO)

35375 SUPERVOLTAGE AND CONVENTIONAL RADIOTHERAPY: A CLINICAL APPRAISAL. Holt, J. A. G. (Inst. of Radiotherapy, Perth, Australia). Radiographer, 11: 6-11(Mar. 1964).

Physical factors related to the use of conventional (250 kv) and supervoltage (2 Mev) x ray therapy are compared, as well as clinical results and complications. Advantages of the higher energy radiation are the increased penetration of supervoltage x rays, reduced energy absorption in the skin, and the displacement of max dose beneath the

skin. Reduction of energy absorption in bone and cartilage is marked for supervoltage x rays because bone contains calcium, and cartilage sulfur. These heavy atoms in these tissues result in a phenomenon wherein the bone and cartilage mass absorption coefficients are therefore different from the soft tissues made up of only hydrogen, oxygen, carbon, nitrogen, etc. (light atoms), and, furthermore, these differences vary with the x-ray energy at which the absorption is measured. Because of almost uniform dose absorption in bone or soft tissue, the use of supervoltage x rays almost nullifies the effect of shielding by the skull and spine in treating intracranial and intrathoracic tumors. The integral dose received is mainly responsible for the patient's general well or ill feeling, for alteration in blood picture during treatment, and for anorexia and loss of weight. It is much lower when more penetrating radiation is used, and hence more patients can withstand treatment to this dose over a greater volume than could be reached using 250-kv x rays. (TCO)

35376 IRON FILTERS IN DIAGNOSTIC RADIOLOGY. Schanze, Ulrich O. Radiography, 30: 259-60(Oct, 1964).

To increase the effective dose to the film while reducing the dose absorbed in the patient, the use of iron filters for radiodiagnosis was investigated. Measurements showed that iron filters, compared with aluminium filters of equal half-value thicknesses at x-ray diagnostic voltages (60–120 kvp), give an increase of dosage output of 6 to 20%. This applies both for smaller as well as larger object-film distances. The resulting increase of dose output is a real gain because it represents an increase in the exit dose which is effective on the film. The dose to the patient is not increased thereby, because for radiation exposure of the patient only the absorbed dose is effective and not the radiation passing through the subject. To measure the increase of dose, the film density was tested by an electrical photometer. At a voltage of about 150 kvp, filters of copper and iron are equivalent and at higher voltages copper is better. Therefore iron is not suitable for filtration of x rays used in radiotherapy. In fluoroscopy the iron filter is of a great importance. Increase in the effective output results in prolonging the life of the x-ray tube by about 20%. Compared with fluoroscopy at 90 kvp with filtration of 5 mm aluminium the necessary load on the x-ray tube, when an iron filter is used, is only 70%. The luminous density on the screen is not changed thereby. In radiography the increase of dose output is not high enough to shorten the exposure time in practice because the human eye is only able to see an increase of exposure of 25%. From the point of view of aging of the x-ray tube, the iron filter gives an advantage in radiography. The use of an iron filter at voltages usual in x-ray diagnostic practice has also the advantage that between 60 and 120 kvp for fluoroscopy and radiography only one filter of iron with a thickness between 0.1 and 0.2 mm is required. (BBB)

35377 CASE OF CHRONIC RADIATION ULCER WITH A NOMA-LOBE COURSE. Kaneyuki, Toshihiro; Furuya, Tachuo; Iki, Hisao (Yamaguchi County Medical Coll., Japan). Rinsho Hoshasen, 9: 755-8(Sept. 1964). (In Japanese).

Development of radioinduced cancer, mainly after occupational exposure or radiotherapy at high dosage, is discussed preliminary to description of a case of chronic radioinduced ulcer. Heavily irradiated skin usually shows atrophy and cornification of the epidermis, enlargement of capillaries, and degeneration of collagen and elastic fibers. The skin has reduced resistance to mechanical injury and is easily broken, so that a chronic, nonhealing ulcer may form which may later be the site of malignancy. Papillary hyperplasia following chronic radiodermatitis seems to be a precancerous stage, preceding squamous cell cancer. In the case described, a 15-yr-old boy was treated for buccal lymphoma with a 12,974-R total x-ray dose plus Ra. A penetrating buccal ulcer developed which resembled gangrenous stomatitis (noma). The ulcer became very painful and prevented the patient from opening his mouth. Originally 3×2 cm^2, the ulcer enlarged to 10×15 cm^2 within a year. On account of cachexia, severe anemia developed which did not respond to treatment. An epithelioma was found at biopsy which eventually caused the patient's death. (BBB)

35378 REPEATED BONE MARROW TRANSPLANTATION. Raisp, Ivo (General Hospital, Slovenj Gradec, Yugoslavia). Sangre, 9: 334-6(1964).

Bone marrow transplantation (BMT), which is used to treat the acute radiation syndrome or leukemia with prior whole-body irradiation, was used in two cases of aplastic anemia. BMT was used in each patient after failure of all conventional treatments, namely steroids and blood transfusions. Only if these methods gave no satisfactory results was BMT tried. All BMT was done within the same blood groups, but both partners of the transplantation were not always relatives. The first patient, a 66-yr-old woman with aplastic anemia of unknown origin received her first BMT from an unrelated donor. No immediate changes followed, so another BMT was repeated some days later, again from a donor who was not a blood relation of the patient. Soon afterwards there was a rise in reticulocytes, luekocytes, and thrombocytes. The rising blood count was due to the first transplantation and not to the second. The second patient, a 40-yr-old woman with aplastic anemia of relapsing type treated over one year with corticoids and blood transfusions, received BMT from her daughter, resulting in a rise in reticulocytes and leukocytes 15 days after the transplantation. The leukocytes and reticulocytes remained high over 6 weeks after the BMT. A secondary syndrome of moderate intensity appeared 3 weeks after the first BMT. The second BMT was made much later, when the blood cell values fell again. There was a rise in leukocytes and reticulocytes 15 days later. A mild secondary syndrome appeared 3 weeks after the second BMT. This patient showed general improvement but the first patient died from an infection. (BBB)

35379 RADIOCARDIOCIRCULOGRAPHIC TECHNIQUE FOR THE COMPREHENSIVE STUDY OF CENTRAL AND PERIPHERAL HEMODYNAMICS. Votchal, B. E.; Vysokii, F. F. (Central Inst. for the Advanced Training of Physicians, Moscow). Vest. Akad. Med. Nauk SSSR, No. 9, 97-105(1965). (In Russian).

A method was devised for the simultaneous investigation of central and peripheral hemodynamics involving inhalation radiocardiography using krypton (^{85}Kr). The patient breathes the radioactive gas which mixes with the blood in various parts of the body (e.g., heart, liver, lungs). Appropriate radiation counters are applied at the pertinent area. By noting the time and duration of radioactivity the rate and amount of blood flowing through the area is determined. Examination of healthy and sick people with various pathological manifestations revealed that the relationship between the duration of blood flow in the arterial and venous portion of the systemic and hepatic circulation changes quite precisely and differentially during cardiovascular and pulmonary-cardiac insufficiencies as well as in hepatic cirrhosis. In general, all parameters were found to be higher, thus indicating an increase in the duration of blood flow (a slowing down) as compared with healthy controls. This method also made it possible to elucidate the mode of action of some cardiovascular medications. Results showed that these drugs increase the rate of blood flow through one or several parts of the circulatory system often at the expense of decreasing it in other parts. This is probably achieved by increasing the tone of the venules and the microtonus of the hepatic aortal system. (ATD)

35380 REPORT ON THE OCCURRENCE OF HERPES ZOSTER IN PATIENTS WITH MALIGNANT TUMORS TREATED WITH IONIZING RADIATION. Vich, Zdenek (Charles Univ., Prague). Strahlentherapie, 130: 198-204 (June 1966). (In German).

Factors that could be important in the origin of herpes zoster were analyzed in 36 patients who were irradiated for malignant tumors. It was found that the localization of herpes corresponded to the irradiated dermatoms in 27 patients (75%). In 8 out of 9 patients in which the localiza-

tion of herpes did not correspond to the irradiated area, a distinct degenerative ailment of the spine was found. It may be concluded that a local irritation of the nerval roots is of importance for producing herpes zoster. For the series of patients investigated, other factors seem to be as yet unproven. (auth)

35381 X-RAY EFFECTS ON THE SKIN AFTER HEMANGIOMA IRRADIATION. Klostermann, Gerald Franz (Univ., Goettingen, Ger.). Strahlentherapie, 130: 205-18(June 1966). (In German).

Patients (384) with hemangiomas were irradiated on the average with 3 × 500 R Chaoul, and control examinations were performed 6 to 13 years after irradiation. Only a few were completely free of late radiation changes. As to be expected, frequency and extent of the radiation damages were proportional to the dose, penetration depth, field size, and also, but not as distinct, dependent on the body region irradiated. Detailed figures are given. A total dose of 1500 R was observed to be the limit for sensory changes in the skin, while less severe changes increased with increased radiation burden. Irradiation during the first or second 6 months of life did not effect the total radiation dose required. Therapeutic consequences are discussed. (auth)

35382 CYCLOTRON FOR BIOMEDICAL RESEARCH. Report No. 2002. Fleischer, A. A. (Cyclotron Corp., Berkeley, Calif.). 13p. (CONF-651113-3). ORAU. Gmelin, AED-CONF-65-322-2.

From 18th Annual Conference on Engineering in Medicine and Biology, Philadelphia.

A 30 in. dia, three-sector, AVF cyclotron was designed for biomedical research. It was designed for minimum initial investment, maximum versatility, simplicity of operation, minimum operating costs, and maximum on time. The performance characteristics of the cyclotron are tabulated. Isotopes that are normally used in diagnostic techniques and the cyclotron-produced, short-lived isotope that can replace the presently used one are listed. (P.C.H.)

CHEMISTRY

General

35383 (MUC-JCW-223(Books 1 and 2)) THE CHEMISTRY, PURIFICATION AND METALLURGY OF PLUTONIUM. Thomas, Charles Allen (Chicago Univ., Ill. Metallurgical Lab.). Dec. 1944. Contract AT(11-1)-223. 540p. Dep. CFSTI $5.50 cy, $2.25 mn.

A monograph on the physical and chemical properties of Pu is presented. Information is included on production of Pu and its compounds, analytical methods, and handling hazards. (J.R.D.)

35384 (ORNL-TM-989(Suppl.1)) A LITERATURE REVIEW OF MASS SPECTROMETRIC-THERMOCHEMICAL TECHNIQUE. Redman, J. D. (Oak Ridge National Lab., Tenn.). July 1966. Contract W-7405-eng-26. 41p. Dep. mn, CFSTI $2.00 cy, $0.50 mn.

Bibliographies are presented on thermochemical properties of gaseous species by mass spectrometry, techniques and instrumentation applicable to thermochemical mass spectrometry, and thermodynamic properties of Be and alkali metal halides. (J.R.D.)

Analytical Procedures

See also Separation Processes and Procedures

Refer also to abstract 35345.

35385 (AERE-Bib-136(Pt.1)) X-RAY FLUORESCENCE ANALYSIS. PART I. BIBLIOGRAPHY. Stoddart, H. A.; Dowden, W. A. (Atomic Energy Research Establishment, Harwell (England)). May 1966. 208p. Dep. BIS $5.40. HMSO 27s. 0d.

This bibliography covers the book, periodical, report, and conference literature for the period 1957 to 1964. Subject indexes are bound separately as AERE-Bib-136 (Part II-Indexes). Sources searched were: Chemical Abstracts, Nuclear Science Abstracts, Analytical Abstracts, Spectrochemical Abstracts, AERE Library Index, book reviews, selective bibliographies, and individual periodicals. (M.C.G.)

35386 (AERE-R-5108) THE DETERMINATION OF ZIRCONIUM IN CERAMIC MAGNESIA BY NEUTRON ACTIVATION ANALYSIS. Baker, C. A. (Atomic Energy Research Establishment, Harwell (England)). Apr. 1966. 14p. Dep. BIS $0.50. HMSO 2s. 6d.

A method is described for microdetermination of Zr in ceramic MgO by thermal neutron activation. The chemical separation of radioactive Zr is based on the precipitation of $BaZrF_6$. Several methods are presented for inspecting the results to ensure an absence of interference from fission-product Zr activity. The limit of detection is 0.1 μg for a flux of 10^{12} n/sec/cm^2. (auth)

35387 (ANL-7174) AUTOMATIC SCAN SYSTEM FOR REACTOR-FUEL ASSAY. Busse, Thomas H.; Beyer, Norman S. (Argonne National Lab., Ill.). Mar. 1966. Contract W-31-109-eng-38. 10p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The fuel scanner system is an auto-gamma spectrometer with automatic sample changer, automatic x-y scanner, and digital printer. Total system physical and electrical relationships are presented in a block diagram. The scanner is primarily a modified machinist lathe. Results from tests of the system are presented. (M.C.G.)

35388 (APDA-183) THE DETERMINATION OF HYDROGEN IN SODIUM METAL. Meacham, S. A.; Hill, E. F. (Atomic Power Development Associates, Inc., Detroit, Mich.). June 1966. Contract AT(11-1)- 865. 38p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A method for differential determination of hydrogen in sodium from sodium hydroxide and hydrogen from sodium hydride and/or dissolved hydrogen is defined. The procedure utilizes a two-stage vacuum-reflux technique employing mercury as the refluxing medium; the hydrogen evolved is quantitatively measured by gas chromatography. By carefully controlling the amalgamation temperature, hydroxide hydrogen, nonhydroxide hydrogen, and total hydrogen can be determined. The recommended procedure is applicable to the determination of 0.2 to 100 μg of hydrogen in sodium with a relative standard deviation of ±5%. The hydrogen thus determined can be hydroxide, nonhydroxide, or total hydrogen. (auth)

35389 (CEA-R-2791) APPLICATION DE LA CHROMATOGRAPHIE SUR PAPIER A LA DETERMINATION DE CERTAINS ELEMENTS DANS LES MINERAUX ET LES ROCHES. (Application of Paper Chromatography to the Determination of Some Elements in Minerals and Rocks). Agrinier, Henri (Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires). 1964. 80p. Dep. mn.

Thesis. Submitted to Paris Univ., France.

Work in applying paper chromatography to the fields of mineralogy, and geology is described. The separation and determination of the following elements were studied: Nb, Ta, Ti, Co, Cu, Mn, Sn, Ge, As, Sb, Bi, U, Th, Be, Au, Pb, Zn, V, and Mo. The development of separation methods for these various elements led to the solving of many interference problems. These methods make it possible to separate and measure mineral components. They also enable searches for trace elements in ores, rocks, soils, and carbonaceous materials. This technique may also be used for analysis in a radioactive environment. (auth)

35390 (CEA-R-2965) CONTRIBUTION AU DOSAGE DE Sb-Ag-Cu-Ga-Mo-Zn PAR ACTIVATION AUX NEUTRONS DE 14 Mev. (Contribution to the Determination of Sb, Ag, Cu, Ga, Mo and Zn Using 14-Mev Neutron Activation). Crambes, Michel (Commissariat a l'Energie Atomique, Grenoble. Centre d'Etudes Nucleaires). Apr. 1966. 52p. Dep. mn.

By using 14-Mev neutron irradiation it is possible to extend the field of application of neutron radioactivation analysis, in particular to the case of light elements. For many other elements it can replace in-pile irradiation thereby making it possible, thanks to portable 14-Mev neutron generators, to carry out radioactivation analyses away from nuclear research centers. Rapid chemical separation methods were developed to make possible the determination of elements which, after exposure to fast neutrons, produce β^+ emitting nuclides which cannot be differentiated by a simple instrumental study, the emitted radiation being of the same type and of similar half life in the two cases. (auth)

35391 (CEA-R-2966) LE DOSAGE SPECTROGRAPHIQUE DU SILICIUM DANS LES ALLIAGES URANIUM-CARBONE-SILICIUM. (Spectrographic Determination of Silicon in Uranium-Carbon-Silicon Alloys). Spitz, Jean-Pierre; Chazee, Jean-Jacques; Tran Van, Danh; Desorges, Francois (Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires). Apr. 1966. 11p. Dep. mn.

The use of spark excitation under controlled Ar atmosphere enables the spectrographic determination of Si in U-C-Si alloys. A method is presented that is rapid and accurate. (auth)

35392 (CEA-R-2980) ETUDES D'ANALYSE PAR ACTIVATION. LE COMPTAGE DES RADIONUCLEIDES DE PERIODES COURTES. VOLUME I. PARTIES A ET B. (Activation Analysis Studies. Counting of Short Half-Life Radionuclides. Volume I. Parts A and B). Junod, Eric (Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires). Mar. 1966. 88p. Dep. mn.

The basic relationships of radionuclides linking their half-life, their counting time, their counting rate, and the number of particles recorded are reviewed. Corrections for counting losses due to the idle period of multichannel analyzers are discussed. Exact correction formulas were drawn up for the case where the short half life radionuclide is pure or contains only a long half life radionuclide. Charts were drawn up showing the approximations given by the so-called active time counting and by the counting involving the real time associated with a measurement of the overall idle period, this latter method proving to be more valid than the former. A method is given for reducing the case of a complex mixture to that of a two-component mixture. (auth)

35393 (EUR-2952.i) DETERMINAZIONE PER VIA CHIMICA DI TRACCE DI CLORO E DI ZOLFO NEI TERFENILI. (Determination of Chlorine and Sulfur in Terphenyls by Chemical Analysis). Serrini, G.; Wehking, W. (European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center). 1966. 26p. Dep. mn.

The determination of chlorine and sulfur in terphenyls by chemical analysis is described. For the determination of chlorine two different combustion methods were employed, the calorimetric bomb and the H_2-O_2 burner. Cl^- was determined by spectrophotometry. The detection limit is 2 ppM for the first method and 0.7 ppM for the second method. The coefficient of variation for both methods is about 10% at level of 10 ppM. For sulfur determination the following methods were examined: combustion by H_2-O_2 burner and spectrophotometric determination of the SO_4^{2-} obtained; and reduction of reducible sulfur by Raney-Nickel and titration of H_2S. For the first method the detection limit is 1.8 ppM and the coefficient of variation is less than 5% for levels from 20 to 60 ppM. The Raney-Nickel method detection limit reported is about 1 ppM with a coefficient of variation of 6.1 and 3.5% for levels of 54.6 and 1.2 ppM S. This method was also used for analysis of terphenyl containing large concentrations of high boilers. The results obtained are in good agreement with those found by other analytical techniques. (auth)

35394 (GA-7041) APPLICATIONS OF NEUTRON ACTIVATION ANALYSIS IN SCIENTIFIC CRIME DETECTION. 14-Month Summary Report, November 1, 1964-December 31, 1965. Bryan, D. E.; Guinn, V. P.; Settle, Dorothy M. (General Dynamics Corp., San Diego, Calif. General Atomic Div.). Mar. 20, 1966. Contract AT (04-3)-167. 57p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Activities are reported in a program to develop methods of determining whether a person fired a gun recently. The method involves detection of traces of Ba and Sb coming from the primer of the cartridge and depositing on the back of the gun hand. Molten paraffin is painted on the hand and removed after solidification. The paraffin is irradiated with thermal neutrons and analyzed radiochemically for ^{139}Ba and ^{122}Sb. Development work is described on methods of using activation analysis to characterize and identify materials often found as physical evidence in criminal cases. Analyses during the report period were concerned with paint, hair, automobile glass, marijuana, pigments, paper, counterfeit money, and moonshine whiskey. The feasibility of tagging gunpowder with rare earths such as Dy and Eu was investigated. (J.R.D.)

35395 (ORNL-3960) DATA COLLECTION AND EVALUATION WITH AN X-RAY DIFFRACTOMETER DESIGNED FOR THE STUDY OF LIQUID STRUCTURE. Levy, H. A.; Danford, M. D.; Narten, A. H. (Oak Ridge National Lab., Tenn.). July 1966. Contract W-7405-eng-26. 61p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

An x-ray diffractometer designed specifically for studies of structure in liquids is described in detail. The diffraction pattern from the horizontal surface of the liquid sample is obtained with a divergent beam technique similar to the Bragg-Brentano flat sample system used for powder samples. The instrument provides for simultaneous angular motion of the x-ray tube and the detector about a horizontal axis lying in the liquid surface. This method eliminates sample holder absorption and scattering. A small furnace for high temperature work is included in the design. Monochromatic x-radiation, essential to good work with liquids, is obtained through the use of a bent and ground crystal monochromator mounted in the diffracted beam. Data collection with this instrument, and the various correction procedures applied to the raw data are discussed in detail. The theory of x-ray diffraction by liquid systems is reviewed in the light of recent developments in this field. The derivation of reduced intensity and radial distribution functions from the diffraction data is described, and ways of obtaining meaningful information on liquid systems from these functions are outlined. (auth)

35396 (PG-Report-709) ANALYTICAL METHOD FOR THE DETERMINATION OF IRON IN HIGH-PURITY PLUTONIUM. Bell, G. A.; Stanwix, P. R.; Boase, D. G. (Production Group, United Kingdom Atomic Energy Authority, Sellafield (England)). 1966. 11p. Dep. BIS $0.50, HMSO 2s. 6d.

A method is described for the determination of Fe in Pu metal. Iron(II)-tris-bathophenanthroline complex is formed in the presence of EDTA which suppresses the interference and hydrolysis of Pu. Solvent extraction of the colored Fe complex into chloroform adds specificity to the method, and subsequent absorptiometric measurement allows the determination of Fe to levels of 1 to 2 ppM in Pu metal. A precision (3σ) of ±10% can be achieved at the 10 ppM level. (auth)

35397 (SFL-A2) GAMMA SPECTROMETRIC DETERMINATIONS OF ^{137}Cs AND POTASSIUM IN FINNISH MILK. Castren, O. (Institute of Radiation Physics, Helsinki (Finland)). Apr. 1966. 26p. Dep. mn.

Methods used and results obtained in a gamma spectrometric milk surveillance program are presented. Special emphasis was given to the estimation of error in the large-volume gamma spectrometric assay. An attempt was made to divide the error into components and to estimate the maximum values of the components. The average potassium concentration in Finnish milk was calculated on the basis of determinations of potassium in dried milk. A value of 1.58 ± 0.05 gK/l was obtained. On the basis of the results annual country-wide production-weighted means for the concentration of ^{137}Cs in Finnish milk was calculated. The following results were obtained: 1960: 87, 1961: 58, 1962: 142, 1963: 243, 1964: 252, 1965: 190 pC/l. (auth)

35398 (SGAE-CH-32/1966) ANWENDUNG DER NEUTRONENAKTIVIERUNGSANALYSE ZUR BESTIMMUNG VON VERUNREINIGUNGEN IN REINKUPFER. (Application of Neutron Activation Analysis to the Determination of Impurities in Pure Copper). Lihl, F.; Patek, P.; Sorantin, H. (Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Institut fuer Chemie). 1966. 27p. Dep. mn.

The theory of activation is discussed along with the estimation of errors. The preparation of samples, irradiation, and γ spectrometric measurements are also discussed. The elements Sb, Se, Fe, Ag, Co, Zn, Ni, and Au can be detected by nondestructive means. The quantitative determination was possible because of the activity of the basic elements and the superposition of γ energies after a chemical separation. Optical spectral analysis and x-ray fluorescence analysis were indicated as additional analytical methods; Pb and Sn can be quantitatively detected. The results obtained with these analyses agree very well. Neutron activation analysis is characterized by high sensitivity and accuracy, but it is slower than the two other methods. (tr-auth)

35399 (UCRL-14440(Rev.1)) THEORETICAL CONSIDERATIONS, DESIGN, AND EVALUATION OF A CASCADE IMPACTOR. Cohen, Jerry J.; Montan, D. N. (Lawrence Radiation Lab., Univ. of California, Livermore). June 20, 1966. Contract W-7405-eng-48. 24p. Dep. mn. CFSTI $1.50 cy, $0.50 mn.

A cascade impactor of the multi-jet, round-hole design was developed which provides easy alteration of impactor stages and variation of air flow. The instrument was evaluated by empirical observation, correlation of mass distribu-

tions of aerosols as determined with the impactor vs membrane filter samples, determination of stage efficiencies and case loss studies. (auth)

35400 (UCRL–16880) SEMIAUTOMATIC INFRARED ANALYZER FOR SERUM TRIGLYCERIDES AND CHOLESTERYL ESTERS. Freeman, Norman K.; Lampo, Edward; Windsor, Alfred A. (Lawrence Radiation Lab., Univ. of California, Berkeley). May 18, 1966. Contract W-7405-eng-48. 14p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

An instrument was developed for the semiautomatic analysis of mixtures of triglycerides and cholesteryl esters. The method is based on high-resolution infrared spectrophotometry, and was previously shown to be applicable to the determination of these components in the nonionic fraction of human serum lipids. A simple nonrecording grating spectrophotometer was suitably modified to carry out this analysis; and appropriate computing circuitry was coupled with it for performing the two-component calculation. The supplementary electronics consist of operational amplifiers, a logarithmic conversion circuit, a digital voltmeter, and a printer. Automatic operation is accomplished by a control mechanism, which programs the measurements, the steps in the calculations, and print-out of the results. Sample preparation consists of an extraction of lipids from serum in such a way as to exclude phospholipids. This may be done in a single step, although a two-step procedure, total lipid extraction followed by adsorption separation of the phospholipids, appears to be more reliable. Measurements were made on a solution of the neutral lipid fraction in carbon tetrachloride. (auth)

35401 (Y–1542) DETERMINATION OF ALUMINUM, SILICON, IRON, URANIUM, AND THORIUM IN BERYLLIUM BY X-RAY FLUORESCENCE. Walden, G. E.; Condrey, Alma D. (Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant). July 19, 1966. Contract W-7405-eng-26. 20p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

X-ray emission spectroscopy has been successfully applied to the determination of Al, Si, Fe, U, and Th in Be. Be metal was converted by pyrohydrolysis to the oxide and the oxide pressed into a hygienically safe pellet using a thermal-setting resin as a binder. Concentration levels for all elements except Al were those normally encountered in Be metal. Al concentration was determined at levels up to 1.0%. (auth)

35402 STANDARD GENERAL METHODS FOR ANALYSIS OF RADIOISOTOPES. Amer. Soc. Test. Mater., ASTM Stand., 474-84(1966).

General procedures are given for analysis of radioisotopes by: heavy metals spot tests, gross beta particle counts, aluminum absorption curves, determinations of gamma impurities, free-acid determination, total-solids determination, and determination of nonvolatile materials. (P.C.S.)

35403 KINETIC CURRENT MEASUREMENTS WITH CONTROLLED POTENTIAL. APPLICATION TO THE URANIUM(V) DISPROPORTIONATION REACTION. Pence, Dallas T.; Booman, Glenn L. (Phillips Petroleum Co., Idaho Falls, Idaho). Contract AT(10-1)-205. Anal. Chem., 38: 1112-19(Aug. 1966).

The correct interpretation of kinetic current measurements obtained by the use of controlled-potential polarography at short times requires a thorough understanding of the electrical characteristics of the cell and of the potentiostat. The practical application of transfer function measurements to test the design and to determine the response time of a controlled-potential polarograph is demonstrated. Errors involved in the measurement of kinetic currents at short times and methods proposed for their correction are discussed. The uranium(V) disproportionation reaction was studied over the time region of 1 msec to 10 sec using the controlled-potential method. The determined value of the rate constant is 192 liter^2 mole^{-2} sec^{-1} for 1M perchloric acid medium. (auth)

35404 RAPID AND SENSITIVE METHOD FOR THE DETERMINATION OF ^{131}I IN MILK BY ION EXCHANGE ON SILVER CHLORIDE. Fairman, William D.; Sedlet, Jacob (Argonne National Lab., Ill.). Contract W-31-109-eng-38. Anal. Chem., 38: 1171-5(Aug. 1966). (CONF-650540–8).

^{131}I, as iodide ion, is separated from other milk constituents by ion exchange on a silver chloride column. After elution as iodic acid from the column by acidified chlorine water, the eluate can be directly analyzed by gamma counting. The time required to analyze a 1-liter sample by this method is approximately 30 min (exclusive of counting time). If beta counting or increased sensitivity is required, the iodine is subjected to two oxidation-reduction solvent-extraction cycles and finally precipitated as silver iodide prior to counting. Chemical and radiochemical yields for both added and metabolized iodide are identical, and are 90 to 95% for homogenized milk and 85 to 95% for raw milk. Total time for the complete procedure (exclusive of counting time) is approximately 2 hr for a single sample. Less than 2 pc of total ^{131}I can be detected in 1 liter of milk, using the complete procedure. The application of the procedure to other materials is discussed. (auth)

35405 DETERMINATION OF ^{90}Sr IN SEAWATER AFTER CONCENTRATION BY MANGANESE DIOXIDE. Shipman, William H. (Naval Radiological Defense Lab., San Francisco). Anal. Chem., 38: 1175-7(Aug. 1966).

The adsorption of strontium by hydrous manganese dioxide was used to concentrate strontium in seawater. The important parameters involved in the concentration process were studied. A complete radiochemical procedure for ^{90}Sr in seawater using the concentration method as a first step is presented. The chemical recovery is simplified by the use of ^{85}Sr, which can be gamma counted after ^{90}Y is milked and beta counted in a low background counter. The procedure yields a good chemical recovery, satisfactory decontamination from radium and other isotopes, and a low reagent blank. This procedure has been applied satisfactorily to a large number of analyses for ^{90}Sr in seawater. (auth)

35406 RADIOCHEMICAL DETERMINATION OF CESIUM USING PERMANGANATE AS A PRECIPITANT. Shipman, William H.; Mueller, David (Naval Radiological Defense Lab., San Francisco). Anal. Chem., 38: 1253-5 (Aug. 1966).

In the evaluation of sodium permanganate as a precipitant for cesium, the difficulties of determining chemical yield were overcome by dissolving the cesium permanganate after counting and assaying the cesium by flame photometry. The important parameters studied were the optimum ratio of cesium ion concentration to the amount of sodium permanganate added and the effect of different acids and their concentration on the flame emission. Once values of the parameters were fixed, a self-absorption curve for the beta counting of ^{137}Cs was constructed. (D.H.M.)

35407 DETERMINATION OF DEUTERIUM ION CONCENTRATION IN DILUTE UNBUFFERED DEUTERIUM OXIDE SOLUTIONS. Baumann, Elizabeth W. (E. I. du Pont de Nemours and Co., Aiken, S. C.). Contract AT(07-2)-1. Anal. Chem., 38: 1255-7(Aug. 1966). (TID–22810).

Three methods for determination of deuterium ion concentration in deuterium oxide solutions were investigated: conventional potentiometric measurements with glass and calomel electrodes, conductometric titration of the acid with base, and colorimetric determination of pD with an acid-base indicator. In the colorimetric method conventional pH indicator colorimetry was adapted to D_2O solutions, and indicator constants for bromophenol blue and bromocresol green in D_2O were determined in a method that did not require standard buffer solutions. These indicators were employed as one-color indicators. Results were: potentiometric measurements were not suitable, conductometric titration provided an alternative independent method to complement the colorimetric indicator

measurements, and the indicator method determined acidity satisfactorily and its simplicity made it suitable for in-line analysis. (D.H.M.)

35408 ANALYSIS OF ^{134}Cs–^{137}Cs MIXTURES BY GAMMA-RAY SPECTROMETRIC METHODS. Yamamoto, Sachio (Naval Radiological Defense Lab., San Francisco). Anal. Chem., 38: 1261-4(Aug. 1966).

Two highly sensitive methods of ^{134}Cs determination, least-squares and gamma-gamma coincidence spectrometry, are described and evaluated with particular attention to their suitability for analyzing mixtures of $^{134}Cs-^{137}Cs$ with low ^{134}Cs content. In the least-squares method the pulse-height spectrum of a mixture of $^{134}Cs-^{137}Cs$ was synthesized, with the aid of a computer, from normalized spectra of each of the components. The gamma-gamma coincidence spectrometry method was most sensitive especially in mixtures of low ^{134}Cs content. The least-squares method was not as precise in mixtures where the $^{134}Cs/^{137}Cs$ ratio was as low as 0.01. (D.H.M.)

35409 APPLICATION OF RADIOMETRIC TECHNIQUES TO QUANTITATIVE PAPER CHROMATOGRAPHY OF IRON, COPPER, MANGANESE, AND COBALT. Landgrebe, A. R.; Gills, T. E.; DeVoe, J. R. (National Bureau of Standards, Gaithersburg, Md.). Anal. Chem., 38: 1265-6(Aug. 1966).

A method for quantitative determination of iron, cobalt, copper, and manganese on paper chromatograms is described. After the chromatographic separation, the ions were precipitated by radioactive trisodium phosphate. The usefulness of the radiometric method of analysis was demonstrated by an analysis of nickel oxide that contained traces of iron, cobalt, copper, manganese, chromium, titanium, magnesium, and aluminum. The main advantage of the paper chromatographic method is that it permits analysis of a number of elements in the same sample. (D.H.M.)

35410 NEAR-INFRARED DETERMINATION OF DEUTERIUM OXIDE IN WATER. Keder, W. E., Kalkwarf, D. R. (Battelle-Northwest, Richland, Wash.). Contract AT(45-1)-1830. Anal. Chem., 38: 1288(Aug. 1966). (BNWL-SA-573).

A rapid and convenient technique for determination of deuterium oxide in water, over the complete concentration range, by infrared spectrophotometry is reported. This procedure uses an ordinary near-infrared spectrophotometer and commercially available cells. It does not require exclusion of atmospheric moisture from the cells or from the samples after the solutions are prepared. The precision is about 1% in D_2O over the entire concentration when 10μl samples are used and 0.1 to 0.2% with 100μl samples. (D.H.M.)

35411 NEUTRON ACTIVATION ANALYSIS OF MICROGRAM AMOUNTS OF THORIUM IN URANIUM ORES AND PROCESS LIQUORS BY MEANS OF ^{233}Th. Travesi, A.; Palomares, J.; Dominguez, G. (Junta de Energia Nuclear, Madrid). Anal. Chim. Acta, 35: 421-6(Aug. 1966).

A method is described for neutron activation analysis of thorium by employing ^{235}Th. Decontamination steps include anion exchange in 12.5 N HCl, precipitation of fluoride, extraction with mesityl oxide, and thorium oxalate precipitation. The time spent is less than 1 hr; spurious activities in counting samples amount only to 2% and can easily be corrected for. The sensitivity of the method is ca. 0.02 μg of thorium in a neutron flux of 10^{12} n/cm^2/sec with an irradiation time of 5 min. (auth)

35412 SIMULTANEOUS DETERMINATION OF SILVER, GOLD AND MERCURY IN HIGH-PURITY LEAD BY NEUTRON ACTIVATION ANALYSIS. Op de Beeck, J.; Hoste, J. (Ghent Univ.). Anal. Chim. Acta, 35: 427-40(Aug. 1966).

A radiochemical method was developed to separate the group of noble metals simultaneously from a lead matrix after irradiation with thermal neutrons. The resulting complex γ spectrum was resolved by matrix calculus. Smoothing of the obtained data to determine the presence of small photopeaks among the background fluctuations, was done by convolution, based on a least squares approximation. The interference of antimony and bromine was studied. Amounts as low as 20 to 30 ppB of Hg and less than 1 ppB of Au were determined in the presence of up to 9 ppM of Ag. (auth)

35413 DETERMINATION OF ZIRCONIUM IN ZIRCONIUM METAL AND ZIRCONIUM POWDER BY USE OF MANDELIC ACID. Norwitz, George (Frankford Arsenal, Philadelphia). Anal. Chim. Acta, 35: 491-8(Aug. 1966).

An accurate gravimetric method is proposed for determination of zirconium in zirconium metal and zirconium powder by use of mandelic acid. The sample is dissolved in a mixture of hydrofluoric, nitric, perchloric, and sulfuric acids, the solution is evaporated to dryness, and the salts are dissolved in dilute hydrochloric acid. Zirconium mandelate is precipitated at 80°C. The residual zirconium in the filtrate is recovered by heating at 80°C overnight and the combined precipitates are ignited to zirconium dioxide. An investigation was made of the factors involved in the dissolution of the sample, precipitation with mandelic acid, ignition of the precipitate, and size of sample. The effect of hafnium is discussed. (auth)

35414 DETERMINATION OF PLUTONIUM BY CONSTANT-CURRENT POTENTIOMETRY. Corpel, J.; Regnaud, F. (Commissariat a l'Energie Atomique, Fontenay-aux-Roses, France). Anal. Chim. Acta, 35: 508-13(Aug. 1966). (In French).

A method is proposed for determination of plutonium in the UO_2-PuO_2 pellets for Rapsodie. The sample is dissolved in a mixture of 11 N nitric acid and 0.1 N hydrofluoric acid, and the plutonium is oxidized with silver(II) oxide. Plutonium(VI) is reduced in the presence of sulfamic acid with an excess of iron(II), which is back-titrated with cerium(IV) solution to a constant-current potentiometric endpoint. Uranium and iron do not interfere and no separation is required. In routine work, the method gives a precision of 0.5%. (auth)

35415 ROUTINE DETERMINATION OF URANIUM IN VEGETATION ASH. Dean, M. H. (Atomic Weapons Research Establishment, Aldermaston, Eng.); Stimson, A.; Green, D. E. Anal. Chim. Acta, 35: 530-3(Aug. 1966).

A procedure for determination of uranium in vegetation ash by neutron activation analysis was devised and high yields were obtained. After irradiating for 2 days and cooling for 2 days silica, organic materials, ^{24}Na, ^{42}K, Al, and other interfering ions were removed or reduced. After the neptunium produced was counted on a continuous-flow proportional counter at daily intervals for 10 days, the data were analyzed by a computer. The time taken for the neptunium separation was about 6 hr and duplicates irradiated in different batches agreed to better than 10%. (D.H.M.)

35416 DETERMINATION OF THALLIUM IN CESIUM IODIDE SCINTILLATORS. Kubota, Hisashi (Oak Ridge National Lab., Tenn.). Anal. Chim. Acta, 35: 534-5 (Aug. 1966).

The response of thallium-activated cesium iodide scintillators was correlated with the thallium content by polarography. Excellent waves were obtained until the thallium content dropped below 0.01%. Two methods of separation of thallium from bulk cesium were tested, an anion-exchange operation and solvent extraction. Sodium hypochlorite and chlorine water were used as oxidants. Both hexone and methyl ethyl ketone were found to extract thallium fully. Good recovery was obtained with either method, but the anion-exchange method is preferable from the standpoint of equipment required and ease of operation. The limit of sensitivity of the polarographic method at 0.5 μA full scale was found to be about 1 μg per ml when the cesium concentration did not exceed 0.1M. To increase sensitivity by going to the lower ranges (0.2, 0.1 A), it was necessary to cut down the total salt content. (D.H.M.)

35417 THE PREPARATION AND STABILITY OF URANIUM CARBIDE SAMPLES FOR THE DETERMINATION OF OXYGEN, HYDROGEN AND NITROGEN BY VACUUM FUSION. Garcia, M. Perez (Junta de Energia Nuclear, Madrid). Anal. Chim. Acta, 35: 536-9(Aug. 1966).

A detailed study was made of variations in the analytical

results for oxygen, hydrogen, and nitrogen contents of uranium carbide. Particular attention was given to the procedures used to prepare the sample before its introduction to the unit for vacuum fusion. The variations shown by these gases as a function of time depending on the storage medium for the uranium carbide were also studied. (D.H.M.)

35418 AN ANALYTICAL METHOD FOR THE "SIMULTANEOUS" DETERMINATION OF DEUTERIUM AND TRITIUM. Garnett, J. L.; Sollich-Baumgartner, W. A. (Univ. of New South Wales, Sydney). Anal. Chim. Acta, 35: 540-3(Aug. 1966).

A method involving a single combustion and reduction process for the simultaneous determination of deuterium and tritium in organic compounds was devised. Some features that influence the accuracy of the analysis are the critical operating temperature of copper oxide furnace, the necessity for complete reduction of the isotopic water, and the temperature of the zinc furnace. A table comparing the method for determination of deuterium and tritium in benzene with established techniques is given. (D.H.M.)

35419 FORENSIC APPLICATIONS OF NEUTRON ACTIVATION ANALYSIS. Smythe, L. E. (Australian Atomic Energy Commission). At. Energy Austral., 9: No. 2, 2-6(Apr. 1966).

The advantages of neutron activation analysis (NAA) are considered, and its forensic application in the analysis of hair, fiber, paints, soils, plastics, adhesives, gunshot residue, and drugs is discussed. Precautions regarding the history, collection, and storage of samples for NAA are listed. (D.H.M.)

35420 NON-DESTRUCTIVE ACTIVATION ANALYSIS. Adams, F.; Hoste, J. (State Univ. of Ghent). At. Energy Rev., 4: No. 2, 113-80(1966).

Nondestructive activation analysis is based on specific irradiations or measurements. Various ways in which activation can be performed e.g., with nuclear reactors, neutron generators and isotopic sources, are described. Direct measurement by gamma spectroscopy and various specialized methods, notably using Compton subtraction, special detectors, coincidence counting, and a data processing machine, is considered. Irradiation with charged particles, protons, deuterons, alpha particles, or ^{3}He ions affords a means of analyzing surfaces, while gamma rays have certain advantages for elements of low atomic number. A survey of the work done in this field is provided in the form of a bibliography of applications of instrumental activation analysis, based on references in the literature for the period 1960 to 1965. (344 references) (auth)

35421 USE OF RADIOACTIVE INDICATORS FOR CONTROL OF THE OFFICIAL METHOD OF DETERMINATION OF ETHYL ALCOHOL IN BLOOD. Collard, J.; Dupain-Klerkx, L.; Govaerts, J. (Univ., Liege). Bull. Soc. Roy. Sci. Liege, 35: No. 1-2, 101-5(1966). (In French).

The determination of ethyl alcohol in blood is controlled by the use of ^{14}C-labeled alcohol; the technique recommended for the radioactive measurement involves mixing directly the alcohol with the liquid scintillator. The values obtained during the determination have a systematic error of 7%. (tr-auth)

35422 RADIOACTIVE KRYPTONATES. Jesenak, Viktor; Toelgyessy, Juraj (Chemicko-Technologicka Fakulta SVST, Bratislava). Chem. Listy, 60: 577-91 (1966). (In Czech).

The chemical and physical properties of krypton are reviewed, including the properties of the hydroquinone clathrate. The application of the hydroquinone clathrate of ^{85}Kr for determination of oxygen, ozone, sulfur dioxide, and water is described. All of these methods depend on the release of ^{85}Kr from the clathrate and the continuous monitoring of the released krypton by counting its radioactivity. A method for following the kinetics and the mechanism of a chemical reaction is also described as well as a method for determining the equivalence point of a titration by the use of the krypton clathrate. (59 references). (TTT)

35423 PRECIPITATION METHODS IN NEUTRON ACTIVATION ANALYSIS. I. CO-PRECIPITATION OF SODIUM IN POTASSIUM PERCHLORATE PRECIPITATION. Rakovic, M.; Prochazkova, Z. (Charles Univ., Prague). Chem. Zvesti, 20: 293-8(1966). (In Czech).

The importance of the correct quantity of hold-back carrier in neutron activation analysis is considered. An excessively large quantity of sodium as holdback carrier increases the quantity of ^{22}Na that is coprecipitated in the precipitation of potassium perchlorate. By selection of a suitable concentration the quantity of coprecipitated sodium is small in the precipitation of potassium perchlorate. Such a procedure is more suitable for radiochemical separation of potassium than the classical procedure used in gravimetry. (TTT)

35424 DETERMINATION AND METAL ELEMENT SEPARATION FROM RARE EARTH MINERALS IN TAIWAN. Chao, Tse-Hung; Chen, Sung-Shien (Union Industrial Research Inst., Taiwan, China). Chemistry (Taipei), No. 4, 122-8(1965). (In Chinese).

The rare earth minerals in Taiwan consist of yellow monazite and black monazite. Most of these minerals are distributed in beach, stream, and offshore sands along the western coast of Taiwan. The heavy minerals contain 2–4% yellow monazite and 10% black monazite. Chemical analyses show that the black monazite contains rare earth elements or their compounds such as CeO_2 (23.18%), Nd_2O_3 (7.95%), Pr_2O_3 (1.27%), Sm, Eu, Gd, La_2O_3 (25.41%), Ho, and Y (1.07%). The formula of black monazite can be expressed as (rare element)$_2O_3 \cdot 2CeO_2 \cdot 2P_2O_5 \cdot 4-4.5SiO_2$, or abbreviated as $RE(PO_4) \cdot SiO_2$. Yellow monazite occurs as a semitransparent or nontransparent yellow, light yellowish green, or light red solid; possesses a lipid-like luster with sp gr 4.9–5.3, and hardness 5–5.5. There are white lines through it and its chemical composition is $REPO_4$. Black monazite occurs as grayish black nontransparent solid and possesses a black opaque luster with sp gr 4.1. There are grayish brown lines in it and its chemical composition is $REPO_4 \cdot 1-1.5SiO_2$. Ion exchange chromatography was found to be a good method for the separation of rare earth elements. (BBB)

35425 POSSIBILITIES FOR DETERMINATION OF OXYGEN IN ALUMINUM BY IRRADIATION WITH α PARTICLES. Deyris, Michele; Albert, Philippe (CNRS, Vitry-sur-Seine, France). Compt. Rend., Ser. C, 262: 1675-8(June 13, 1966). (In French).

Experiments made on very high-purity aluminum showed nuclear reactions that can impede or even inhibit the determination of oxygen. By α irradiation at energies below 35 Mev, it is possible to determine the oxygen concentrations higher than 3 ppM in Al. (tr-auth)

35426 GERMANIUM IN THE ROCKS G-1 AND W-1 DETERMINED BY NEUTRON-ACTIVATION ANALYSIS. Morris, D. F. C.; Batchelor, J. S. P. (Brunel Univ., London). Geochim. Cosmochim. Acta, 30: 737-8(July 1966).

The Ge content in the two silicate rocks G-1 and W-1 was determined by neutron activation analysis using 11.3-hr ^{77}Ge as the main source of activity since it could be counted conveniently with simple Geiger-Mueller equipment. Values of 1.1 and 1.1 ppM were found for G-1 and 1.7 ppM for W-1. (P.C.H.)

35427 BIOASSAY AND ENVIRONMENTAL ANALYSIS BY LIQUID ION EXCHANGE. Butler, F. E.; Boulogne, A. R.; Whitley, E. A. (E. I. du Pont de Nemours and Co., Aiken, S. C.). Health Phys., 12: 927-33(July 1966).

Liquid ion exchange has replaced several solid ion exchange and extraction procedures at the Savannah River Plant (SRP). The principal advantage of the method is rapidity; many ions exchange from one liquid phase to the other within a few seconds. Separation procedures are relatively simple; an acidic aqueous sample is mixed with an equal volume of liquid ion exchange reagent diluted in an inert solvent. The cation exchanger is di-2-ethylhexyl phosphoric acid (HDEHP) and the anion exchanger is triisooctylamine (TIOA). The ion exchange characteristics

of thirty-seven elements were determined. Variations in exchangers, acid concentrations, and stripping solutions resulted in separation of specific radionuclides from environmental and bioassay samples. HDEHP and TIOA are used to separate radionuclides with similar gamma energies prior to spectrometric analyses. A complex mixture of ^{141,144}Ce and ^{239}Np, ^{51}Cr and ^{131}I, ^{58}Co and ^{140}Ba + La, for instance, which previously required 24 hr for analysis, can now be separated and analyzed in 1 hr. TIOA is a more efficient absorber of all forms of iodine than chloroform, the commonly used iodine absorber. TIOA is also used instead of tributyl phosphate extraction for alpha emitters. Many cations exchange to HDEHP from dilute acid solutions and this technique is used to concentrate radionuclides from environmental and bioassay samples. (auth)

35428 SELF-ABSORPTION CORRECTION FOR ^{14}C SAMPLES. Kuo, Shen-tu; Ku, Chi-shun; Li, Yun-hua (Inst. of Applied Chemistry, Academy of Sciences, China). Hua Hsueh Hsueh Pao, 31: 101-110(1965).

The self-absorption and scattering of β rays emitted by ^{14}C-containing samples of different thicknesses mounted on planchets is discussed, and an equation was derived to express the observed counting rate (counts per min) as a function of sample weight per cm^2. This is valid even when the sample thickness approaches zero. The equation used for correcting radioactivity measurements for loss of radiation due to self-absorption is presented; the ratio of the specific activity at zero absorption to that of the observed specific activity per min per mg of sample is expressed as a function of the weight per cm^2. The correction is negligible when the sample is counted at extremely low weight. (Anal. Abstr.)

35429 EFFECT OF IONIZABLE SURFACE ACTIVE SUBSTANCES ON THE ELECTROREDUCTION OF COPPER AND URANIUM. DETERMINATION OF THE TWO ELEMENTS IN PRESENCE OF EACH OTHER. Issa, I. M. (Univ. of Assiut, UAR). J. Chem. UAR, 8: 117-28(1965).

The effects of surface active agents (detergents) on the polarographic reduction of the mixture U(VI)-Cu(II) were studied. Means were sought by the use of surface active agents to develop a method for determining one metal in the presence of the other. The reduction of sexavalent uranium at the RDME-type electrode is retarded by $DDSO_4^-$ (dodecyl sulfate anion) but enhanced by an appreciable concentration of DDA^+ (dodecylamine cation) in 0.8M H_2SO_4. Reduction of Cu(II), on the other hand, is enhanced by $DDSO_4^-$ and completely retarded by DDA^+ in the same supporting electrolyte. Advantage is taken of these findings to determine both elements in presence of each other. U(VI) is determined in presence of Cu(II) ions by using a supporting electrolyte consisting of 0.8M H_2SO_4 and 10^{-2}% DDA^+. The diffusion current of U(VI) is measured at –0.4 v. Cu(II) is determined in presence of U(VI) by using a supporting electrolyte consisting of 0.8M Na_2SO_4, 10^{-3}% $DDSO_4^-$, and 10^{-3}% Triton X-100. The diffusion current of Cu(II) is measured at –0.1 v. (BBB)

35430 CHROMATOGRAPHY AND ELECTROCHROMATOGRAPHY OF INORGANIC SALTS WITH HYDROGEN SULFATE AND PYROSULFATE GLASSES. Kuehnl, Hubert; Khan, Muhammad Aslam (Justus Liebig-Univ., Giessen, Ger. Technische Hochschule, Hanover). J. Chromatog., 23: 149-64(June 1966). (In German).

The separation of different inorganic ions by means of column- and electro-chromatography was studied, using powdered silicate glasses as adsorbing medium and molten $KHSO_4$ or $K_2S_2O_7$ as liquid phase. Al^{3+} and Fe^{3+} were adsorbed from a $KHSO_4$ melt by Jenaer glass and Al_2O_3-free glasses. The alkali metal ions and divalent Mn, Co, Ni, Cu, as well as Ce(III), Ti(IV), and U(VI) were not retained and could be separated from iron and aluminum. Complete elution of all adsorbed ions was achieved by molten $K_2S_2O_7$ at 420°C. During electrochromatographic experiments with eutectic $K_2S_2O_7$–$KHSO_4$ melts at 325–350°C migration towards the anode was observed in the case of U(VI), Ti(IV), and partially V(V). The divalent cations and Ce(III) moved in the direction of the cathode. (auth)

35431 A RAPID METHOD FOR PRECISE GAS PHASE ANALYSIS OF ^{14}C-LABELED COMPOUNDS. Cacace, F.; Perez, G. (Univ., Rome). J. Label. Compounds, 2: 102-6(Jan.-Mar. 1966).

A device coupled to a suitable ionization chamber is described for the fast and accurate routine analysis of organic samples labeled with ^{14}C. The procedure used for ^{14}C analysis is described. The entire operation can be carried out in about 20 min by unskilled personnel. (P.C.H.)

35432 INEXPENSIVE CARTRIDGE FOR THE COLLECTION OF RADIOACTIVE METHYL ESTERS FROM GAS-LIQUID CHROMATOGRAPHS. Bennett, Mildren; Coon, Edmund (Children's Hospital Medical Center, Oakland, Calif.). J. Lipid Res., 7: 448-9(May 1966).

An economical cartridge for collection of methyl esters of radioactive fatty acids in the effluent stream from a gas-liquid chromatograph was fabricated. The glass cartridges (Tri-carb cartridges No. 6001039) are filled with glass wool (Pyrex brand, fine grade) to about 5 mm from either end. After the collection the glass wool is extruded into a low-potassium glass vial containing 14 ml of scintillator solution (0.3 g of 2-bis[2-(5-phenyloxazolyl)] benzene and 5.0 g of 2,5-diphenyloxazole in 1 liter of reagent grade toluene) and the empty cartridge is also dropped into the same vial for counting. A mixture of methyl esters, to which linoleate-^{14}C had beed added, was applied directly to a glass-wool cartridge which was then held in the effluent stream and no radioactivity was lost during a heating period of 3 min. These cartridges proved as satisfactory as the more expensive ones used previously. (TCO)

35433 ELECTROMETRIC DETERMINATION OF YTTRIUM AS MOLYBDATE. Srivastava, Kashi Prasad (Birla Inst. of Tech. and Science, Pilani, India). J. Proc. Inst. Chemists (India), 38: 73-7(Mar. 1966).

Conductometric determination of yttrium(III) was carried out successfully at 30 ± 0.5°C by titrating it against sodium molybdate solution in 2.5 to 5% ethanol. An overall effect of ethanolic concentration on the results was also studied. Curves obtained in direct as well as reverse titrations show a sharp break at the end-point (molar ratio $Y : MoO_4^{2-}$ of 2 : 3) and lend support to the formation of normal yttrium molybdate. The reaction involved is represented as: $2Y(NO_3)_3 + 3Na_2MoO_4 \rightarrow Y_2(MoO_4)_3 + 6Na^+ + 6NO_3^-$. In direct titrations there is a very slight change in the conductance up to the equivalence point, which is probably due to the fact that with the addition of sodium molybdate, the corresponding yttrium and molybdate ions are removed as $Y_2(MoO_4)_3$ and the effect caused due to the decrease in yttrium ion concentration is very nearly compensated by the sodium ions added. In the post-equivalence region, the curve shows a steep rise in conductance because of the addition of excess of molybdate. In reverse titration a steady increase in the conductance up to the equivalence points is due to the displacement of MoO_4^{2-} ions by more mobile NO_3^- ions. After complete precipitation the conductance increases because of the addition of $Y(NO_3)_3$. The presence of ethanol improves the endpoint slightly because it reduces the solubility of yttrium molybdate. Thus the method can be used for the titrimetric determination of Y^{3+} on a micro-scale. It can also be used to estimate molybdate. (BBB)

35434 AMPEROMETRIC DETERMINATION OF CERIUM AND VANADIUM IN A MIXTURE WITH TWO POLARIZED ELECTRODES. Singh, D.; Varma, Asha (Banaras Hindu Univ., Varanasi, India). J. Sci. Res. Banaras Hindu Univ., 15: 68-72(Dec. 1964).

A modified technique based on previous attempts at the potentiometric estimation of cerium and vanadium is described. Successive determination of cerium(IV) and vanadium(V) in their binary mixtures with ferrous ammonium sulfate was carried out at 25°C amperometrically using two platinum wire electrodes at 100 and 50 mv, respectively. At an acidity of 2.5M with respect to sulfuric acid, cerium was estimated successfully, and vanadium did not interfere with the cerium determination under these conditions. After completion of the reaction with cerium

and lowering the acidity of the system to 0.1 to 0.2M sulfuric acid, vanadium(V) is titrated with ferrous iron. The results obtained are fairly accurate, and the procedure is simpler than earlier ones. The error for the bielectrode amperometric titration of the binary mixtures is well within experimental limits. The titration curve is in essential agreement with that predicted by Lingane, based on quantitative treatments under ideal conditions. (BBB)

35435 POSSIBILITY OF AN ISOTOPIC EFFECT IN CHERENKOV RADIATION. Koch, F.; Magyari, E. (Babes-Bolyai-Univ., Cluj). Kernenergie, 9: 168-9(May 1966). (In German).

Differences in angles of Cherenkov radiation from isotopic compounds were found. This fact may be utilized in isotope analysis. If the same accuracy should be attained as in the refractometric method, the experimental technique must be improved. (auth)

35436 DETERMINATION OF URANIUM SURFACE-CONCENTRATION OF COATED PARTICLES. Koss, P.; Buchner, K. H. (Oesterreichische Studiengesellschaft fuer Atomenergie, Seibersdorf, Austria). Kerntechnik, 8: 302-6(July 1966). (In German).

Uranium contamination of the surface of coated particles must be kept as low as possible in order to avoid poisoning the primary circuit. Two methods are available for determination of the surface impurities, measurement of the α radiation of the particle surface and measurement of the fission products released by fission recoil at the surface. Coated particles were studied with respect to the magnitude of the contamination to be expected and by measurement of the fission gas release. The methods used for both measurements are described and the results are reported. The fission product measurement possesses the advantage that it can be determined by enrichment degree and a mass spectrometric analysis of the uranium can be avoided in most cases. Recoil constituents of the fission product release can be determined directly in the burnup of the particle in the reactor. (J.S.R.)

35437 MICRO DETERMINATIONS OF ORGANIC COMPOUNDS LABELED WITH TRITIUM OR ^{14}C. Koch, H. (Institut fuer Angewandte Radioaktivitaet, Deutsche Akademie der Wissenschaften, Leipzig). Kerntechnik, 8: 322-5(July 1966). (In German).

Methods of activity measurement are summarized and the chemical conversion of samples to be analyzed is discussed. The technique for activity measurements using gas ionization chambers is outlined for ^{14}C and tritium. Examples of the activity calculation from the measurement results are given. (J.S.R.)

35438 A NEW, SIMPLE METHOD FOR THE DETERMINATION OF THYROXINE IN SERUM. Nakajima, Hironori; Kuramochi, Masaaki; Horiguchi, Toji (Chiba Univ. School of Medicine, Japan). Nippon Naibunpi Gakkai Zasshi, 40: 1303-7(Jan. 20, 1965). (In Japanese).

A new radioisotope method for the determination of serum thyroxine (T_4) was devised, based on the resin uptake of $^{131}I-$triiodothyronine (T_3). A tracer dose of $^{131}I-T_3$ and resin (IRA 400, formate form) was added to prepared test serum. After 30 min $^{131}I-T_3$ resin uptake was counted in a well-type scintillation counter. The standard curve for 0.25 to 0.2 μg T_4 indicated a straight line relation. The recovery of thyroxine in serum ranged from 46.7 to 49.2%. The amount of T_4 in the test serum was determined from the standard curve according to the resin uptake and multiplied by 50/R (R is recovery) to express it in μg/100 ml. The thyroxine iodine was calculated as 65.3% of this value. A table shows the T_4 or T_4-iodine values obtained by the present method. Results showed that this simple, rapid, and reliable method is of value for routine clinical use in place of PBI determinations. (TCO)

35439 EXTRACTION OF LANTHANIDES BY MEANS OF THENOYLTRIFLUOROACETONE. Genow, L.; Kassabow, G.; Tscholakowa, J. (Chemisch-Technologisches Institut, Sofia). Monatsh. Chem., 96: 2005-9(1965). (In German).

The partition of $Pr(NO_3)_3$, $Ho(NO_3)_3$, and $Lu(NO_3)_3$ between water and thenoyltrifluoroacetone solutions in benzene was studied. The linear relation between pH and log D is plotted for ionic strength 0.1 and 0.2M TTA in benzene is plotted, using initial aqueous concentration of 200 μg/ml. After separation of the two phases the metal concentration in each phase was determined spectrophotometrically with arsenazo III. The average equilibrium constants were found to be: 1.00×10^{-9} for Pr; 6.16×10^{-8} for Ho; 1.47×10^{-7} for Lu. As expected, the plot of log D against pH has a slope of 3. Equilibrium constants for the elements at the beginning of the series vary more than those at the end of the series. (BBB)

35440 CHROMATOGRAPHIC SEPARATION OF SOME URANIUM-FISSION PRODUCTS AND URANIUM WITH ION-EXCHANGE PAPER. Getoff, N.; Bildstein, H. (Oesterreichische Studiengesellschaft fuer Atomenergie GmbH, Seibersdorf, Austria). Oesterr. Chem. Zeit., 66: 72-4(1965).

The R_F values of U and some fission products on cation-exchange paper (Whatman P20) with a variety of mineral acids were investigated. Uranium can be separated from ^{95}Zr and ^{95}Nb with 0.5 to 1.0% HF solution, and U, ^{90}Sr, ^{90}Y, ^{140}Ba, and ^{140}La can be separated from one another with 2N HCl; ^{90}Sr and ^{140}Ba are also selectively isolated with 5N HNO_3. A sharp separation of ^{90}Sr, ^{90}Y, and ^{137}Cs is obtained by pre-treating the paper with NH_4Cl solution and use of M-α-hydroxyisobutyric acid at pH 5 as the mobile phase. (Anal. Abstr.)

35441 SIMPLE ANALYSIS OF AQUEOUS SOLUTIONS LABELED WITH DEUTERIUM. Mercea, I. Rev. Chim. (Bucharest), 16: 162-3(1965).

Complete liberation of hydrogen from aqueous solutions labeled with ^2H was achieved by decomposition of the labeled substance (acidic or basic) with CaH_2 or $LiAlH_4$ in the apparatus described and illustrated. Isotopic analysis of the resulting gas was effected by gas chromatography, with H of natural composition as carrier gas and a thermal conductivity cell as detector. The procedure used is described. Accurate results were obtained over the range from 1 to 97% of ^2H in water, sulfuric acid, sodium hydroxide, blood serum and urine; in each instance, practically all the ^2H was found in the evolved gas. For other substances, this method is applicable after conversion of the entire hydrogen content into water. (Anal. Abstr.)

35442 SEPARATION OF NIOBIUM AND TANTALUM FROM POTASSIUM HYDROXIDE SOLUTION BY THE ANION EXCHANGE METHOD. Isono, Toshiaki (Inst. of Physical and Chemical Research, Tokyo). Rika Gaku Kenkyusho Hokoku, 40: 190-3(1964). (In Japanese).

The separation of niobium and tantalum by anion exchange in a mixed aqueous solution of potassium niobate and tantalate was investigated. A good result was obtained on solutions prepared by fusing niobium and tantalum oxides with potassium hydroxide and leaching with water separately, and mixing these solutions at room temperature, provided the separation procedure was undertaken within 50 hr after mixing. When solutions were prepared by fusing mixed oxides of these elements or mineral ores, it was impossible to separate niobium and tantalum completely. Powder x-ray diffraction patterns suggested that compounds such as $K_8Nb_mTa_nO_{19}$ (m + n = 6) should exist in crystals formed from the aqueous solution which is obtained by fusion of mixed oxides of niobium and tantalum. As a result, anions containing both niobium and tantalum may exist in aqueous solutions of these compounds, illustrating the difficulty of separation of niobium and tantalum by means of anion exchange. (BBB)

35443 DETERMINATION OF CHLORINE IN SELENIUM BY NEUTRON ACTIVATION ANALYSIS. Gobrecht, H.; Tausend, A.; Braetter, P.; Willers, G. (Technische Univ., Berlin. Hahn-Meitner-Institut fuer Kernforschung, Berlin). Solid State Commun., 4: 307-10(June 1966).

By means of neutron activation analysis a sensitive determination of chlorine traces in selenium was developed. The nuclide used for detection is ^{38}Cl. Its half life of 38 min requires a rapid chemical separation from the matrix.

The calculated limit of detection is 0.01 ppm. The Cl concentration of three different specimens of high purity selenium and of single crystals of different growth was determined. The effectiveness of vacuum distillation for deliverance of Se from chlorine was tested. (auth)

35444 DETERMINATION OF SULPHUR AND ANTIMONY IN SELENIUM BY EPITHERMAL NEUTRON ACTIVATION ANALYSIS. Gobrecht, H.; Tausend, A.; Braetter, P.; Willers, G. (Technische Univ., Berlin. Hahn-Meitner-Institut fuer Kernforschung, Berlin). Solid State Commun., 4: 311-14(June 1966).

A method for the sensitive determination of sulphur and antimony in selenium is described. The trace elements are activated by epithermal neutrons inducing the reactions $^{32}S(n,p)^{32}P$ and $^{121}Sb(n,\gamma)^{122}Sb$. The thermal flux is screened by cadmium. The limit of detection is 0.05 ppm S and 0.001 ppm Sb respectively (effective neutron flux about 10^{12} cm^{-2} sec^{-1}, irradiation time 36 hr, sample mass 1 g). (auth)

35445 APPARATUS FOR NON-DESTRUCTIVE MEASUREMENT OF URANIUM ENRICHMENT. Lavie, J.-M.; Barthoux, A.; Delcroix, V.; Desfosses, J.; Laval, M. (Commissariat a l'Energie Atomique, Paris). pp 377-85 of STI-PUB-114. (In French).

An apparatus that permits the rapid measurement of the ^{235}U enrichment of a nuclear fuel in any form is described. The apparatus is designed so that the measurement can be carried out on widely differing types of samples without altering the chemical nature of the uranium compound or even changing its physical shape. The detection probe consists of a sodium iodide scintillator in conjunction with a photomultiplier placed in a lead castle through which there is a hole acting as a collimator. The electronic apparatus consists of two single-channel selectors and a drift stabilizer. The range of measurement is from 1 to 100%. The accuracy is a function of the duration of the measurement and the enrichment. With an enrichment of 5% and a counting time of 20 min the relative error is only 4.5%. (auth)

35446 ORGANIC CO-PRECIPITANTS. XXI. USE OF INDIFFERENT CO-PRECIPITANTS IN THE DETERMINATION OF URANIUM IN NATURAL WATER. Kuznetsov, V. I.; Gorshkov, V. V.; Akimova, T. G.; Nikolskaya, I. V. Tr. Kom. Anal. Khim., Akad. Nauk SSSR, Inst. Geokhim. Anal. Khim., 15: 296-305(1965).

The coprecipitation of UO_2^{2+} from very dilute solutions as a complex with arsenazo I was studied. To 1 liter of clear sample (≡ ≤5 μg of U), 9 ml of conc. HCl, 10 ml each of 5% EDTA and 0.05% arsenazo I solution and 20 ml of 20% diphenylguanidinium chloride solution were added; the pH adjusted to 4 to 5 with 15% hexamine solution, 10 ml of 20% ethanolic diphenylamine added, and the solution set aside for 20 min. The precipitate was collected on a glass filter or on paper moistened with the wash solution (10 ml of arsenazo solution, 20 ml of diphenylguanidinium solution, and 10 ml of diphenylamine solution added to 1 liter of H_2O). The precipitate was dissolved by adding small portions of acetone–ethanol (1:2). The solution was diluted to 25 ml with this mixture, and the extinction (red filter) in 2-cm cells immediately measured. Then 2 or 3 drops of aqueous H_2O_2 was added, the extinction again measured, and the U content found by referring the difference in the measurements to a calibration graph. (Anal. Abstr.)

35447 DETERMINATION OF CALCIUM AND STABLE STRONTIUM IN FOOD PRODUCTS. Pavlotskaya, F. I.; Levina, G. P. (Vernadskii Inst. of Geochemistry and Analytical Chemistry, Moscow). Zh. Anal. Khim., 21: 553-7(1966). (In Russian).

For determination of calcium and stable strontium in food products and biological material it is suggested that they be separated from the accompanying elements by ion exchange chromatography. The method permits determination of calcium and strontium from a single sample, although the content of calcium in a sample is 2 to 3 orders higher than that of strontium. (auth)

35448 DETERMINATION OF RADIOACTIVE STRONTIUM IN ATMOSPHERIC PRECIPITATION. Bakacs-Polgar, E.; Kurcz-Csiky, I. (Inst. of Public Health, Budapest). Zh. Anal. Khim., 21: 558-60(1966). (In Russian).

A rapid method was developed for routine determinations of radioactive strontium in atmospheric precipitation without separation of barium. The ^{90}Sr to ^{89}Sr ratio is determined after yttrium is separated by a method based on the different solubility of yttrium and strontium oxalates in acid solutions. (auth)

35449 EXTRACTION-PHOTOMETRIC DETERMINATION OF LANTHANUM AS AN ALIZARIN-HYDROXYQUINOLINATE COMPLEX. Serdyuk, L. S.; Lazorina, S. M. (Dnepropetrovsk State Univ., USSR). Zh. Anal. Khim., 21: 561-3(1966). (In Russian).

Lanthanum can be determined by an extraction-photometric method as an alizarin-hydroxyquinolinate complex in the presence of cerium oxidized by hydrogen peroxide, or yttrium, which is masked by sodium salicylate. n-Butyl alcohol is used as an extractant. The mean deviation of a single determination is not more than ±3.3%. (auth)

35450 MEASUREMENTS OF PHOTOLYTIC SILVER IN EMULSIONS BY MEANS OF ACTIVATION ANALYSIS. Kocherov, N. P.; Perfilov, N. A. Zh. Nauch. Prikl. Fotogr. Kinematogr., 9: 360-3(Sept.-Oct. 1964). (In Russian).

Studies related to the increase of the sensitivity of emulsions toward ionizing radiations and to the determination of the nature of the particles from the ionization characteristics of the tracks in the emulsion require the quantitative determination of the photolytic silver formed during exposure to such radiations. In order to protect the latent image centers against oxidation by fixing solutions, the treatment with gold proposed by T. H. James, was used before fixing. It was found that the increase of the background silver at the start of the process is probably due to the protection of fog centers. Physical development was used, followed by fixing with a 20% solution of $Na_2S_2O_3$ at a temperature below 10°C. Activation was based on the 2.4-min half life isotope ^{108}Ag. The specimens were exposed to an ~10^{12} n cm^{-2} sec^{-1} beam of the reactor for 12 minutes. The β-decay curves were taken for time periods starting 3 min after completion of the irradiation. Advantage was taken of the fact that the cross section of Ag decreases less abruptly with decreasing energy than that of sulfur and other elements present in the emulsion; therefore, in order to decrease the activity due to other elements, the film was placed in a 1-mm-thick cadmium container. The sensitivity of the method is shown by the fact that 0.67×10^{-9} g cm^{-2} of silver on a 3.8-cm^2 sample could be determined with an accuracy of 10%, making it possible to determine the photolytic silver formed during normal exposures to α particles of ^{239}Pu. (TTT)

35451 ACTIVATION ANALYSIS, PRINCIPLES AND APPLICATIONS. Proceedings of a NATO Advanced Study Institute Held in Glasgow. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965. 219p. (CONF-640818).

Proceedings of a NATO-sponsored conference on activation analysis are reported. A separate abstract was prepared for each of the 25 papers. Detailed instructions for laboratory exercises are included. (P.C.S.)

For abstracts of individual papers see: 35192, 35452–35467, 35572, 35766–35768, 35987, 36145, 36146, and 36184.

35452 SCINTILLATION SPECTROMETRY. Gibbons, D. (United Kingdom Atomic Energy Authority, Wantage, Eng.). pp 27-39 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Gamma spectrometry enables activation analysis to be used as a rapid nondestructive instrumental technique, with the possibility of determining several elements simultaneously. The cathode follower, main amplifier, multichannel analyzer, and anticoincidence shield are considered. (P.C.S.)

35453 ACTIVATION ANALYSIS: BASIC PRINCIPLES. Wainerdi, R. E. (Texas A and M Univ., College Station).

pp 41-5 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Basic principles and criteria for accurate use of activation analysis are given. Various approaches to the problem of distinguishing the induced radiation due to one element from all the other induced radioactivities are discussed. (P.C.S.)

35454 USE OF ACCELERATORS AS NEUTRON SOURCES. Guinn, V. P. (General Atomic Div., General Dynamics Corp., San Diego, Calif.). pp 51-5 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Conversion of readily available electron accelerators to neutron and photon sources for use in activation analysis is discussed. Data are included for a large number of elements that can be detected using thermal neutrons and the limit of sensitivity at various neutron fluxes. (P.C.S.)

35455 FAST NEUTRON ACTIVATION ANALYSIS. Gibbons, D. (United Kingdom Atomic Energy Authority, Wantage, Eng.). pp 61-8 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

The design and theory of a 14-Mev neutron generator and methods of particle acceleration are discussed. Activation analysis systems and methods for determination of Al, O, and P and Ba are given. (P.C.S.)

35456 NEUTRON ACTIVATION ANALYSIS WITH REACTOR PULSES. Guinn, V. P. (General Atomic Div., General Dynamics Corp., San Diego, Calif.). pp 69-72 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

The reactor-pulse technique, useful for identification of nuclides with short half lives, is reviewed using the General Atomic TRIGA as a model. (P.C.S.)

35457 RADIOCHEMICAL METHODS IN ACTIVATION ANALYSIS. Thomson, S. J. (Glasgow Univ.). pp 73-83 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

The importance of carriers, their selection, and their restrictions in purification of target material for activation analysis are stressed. Methods of radiochemical separation are discussed. (P.C.S.)

35458 ERRORS IN ACTIVATION ANALYSIS. Gibbons, D. (United Kingdom Atomic Energy Authority, Wantage, Eng.). pp 85-9 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Precautions against contamination during preparation of samples for activation analysis are discussed. Self-shielding of neutrons by the samples, occurrence of alternative neutron-induced reactions, contamination by radioactive materials after irradiation, possibility of nonstoichiometric precipitation and unusual isotopic ratios are given as further sources of error. The use of a computer was suggested to diminish errors arising from measurement of activity, γ spectrometry, and counting statistics. (P.C.S.)

35459 COMPUTER METHODS IN ACTIVATION ANALYSIS. Gibbons, D. (United Kingdom Atomic Energy Authority, Wantage, Eng.). pp 97-106 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Advantages and limitations of computer methods for optimization of programs, Fourier transformation analysis, and evaluation of γ spectra are discussed. (P.C.S.)

35460 OXYGEN IN METALS. Crawford, G. I. (Glasgow Univ.). pp 113-18 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Activation analysis is discussed as a method for rapid determination of the oxygen content of steel during manufacture. (P.C.S.)

35461 ACTIVATION ANALYSIS IN CLINICAL SCIENCE. Lenihan, J. M. A. (Regional Physics Dept., Glasgow). pp 119-24 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Clinical applications of activation analysis are reviewed in relation to identification of the essential trace elements present in man. Discussions of enzyme activity, epidemiology, and toxicology illustrate the scope of methods using activation analysis. (P.C.S.)

35462 FORENSIC APPLICATIONS OF ACTIVATION ANALYSIS. Guinn, V. P. (General Atomic Div., General Dynamics Corp., San Diego, Calif.). pp 125-7 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Brief accounts of case work involving activation analysis are given. Techniques are described for identification of gunshot residues, coins, adhesive tape, automobile putty, and paint. (P.C.S.)

35463 ACTIVATION ANALYSIS IN THE PETROLEUM AND CHEMICAL INDUSTRY. Guinn, V. P. (General Atomic Div., General Dynamics Corp., San Diego, Calif.). pp 129-32 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Uses of activation analysis in petroleum and related industries are reviewed. Determination of pesticide residues in foodstuffs is discussed. (P.C.S.)

35464 HANDLING OF BIOLOGICAL MATERIAL. Smith, Hamilton (Glasgow Univ.). pp 139-42 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Problems of contamination in preparation of biological samples for activation analysis are discussed. The most common method for digestion (destruction of the organic matrix and dissolution of the trace elements) after irradiation is given. (P.C.S.)

35465 TRACE ELEMENTS IN PLANT AND ANIMAL TISSUES. Bowen, H. J. M. (United Kingdom Atomic Energy Authority, Wantage, Eng.). pp 143-8 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Sensitivity, freedom from contamination, and the possibility of internal checks are discussed as the main advantages offered by activation analysis. Disadvantages are also considered and alternative methods proposed for some samples. Data are presented for trace-element determinations in blood for comparison of activation analysis with more-standard techniques. A tabular survey of the elements studied by activation techniques is presented. (P.C.S.)

35466 PRODUCTION OF A HOMOGENEOUS BIOLOGICAL MATERIAL FOR INTERCOMPARISON OF ELEMENTARY ANALYSES BY DIFFERENT LABORATORIES. Bowen, H. J. M.; Cawse, P. A. (Atomic Energy Research Establishment, Wantage, Eng.). pp 149-51 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Preparation of leaf tissue from Marrow Stem Kale (Brassica oleracea) as a biological standard for interlaboratory comparison of analyses is discussed in detail. (P.C.S.)

35467 TRACER TECHNIQUES IN ANALYSIS. Whitley, J. E. (Scottish Research Reactor Center, East Kilbride, Scotland). pp 153-9 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

The use of radioactive tracers as indicators, and in radio-release analysis is considered as an alternative method of analysis where activation is not sufficiently sensitive. Isotope dilution analysis is also considered. Examples and methods are given. (P.C.S.)

35468 RADIATION IONIZING DETECTOR. Furukawa, Naohiko (to Mitsubishi Rayon Co., Ltd.). Japanese Patent 1964-29696. Dec. 21, 1964. Filed Mar. 31, 1961.

A radiation ionizing detector is patented that is suitable for gas chromatographic work. The detector consists of a negative pole forming the outer wall with an inlet and outlet for the gas, a positive pole, and a radiation source (the latter two are inside the outer wall). An insulating member with a hole is installed near the top of the positive pole. Through this hole the carrier gas and a mixture of the gas and the sample vapor are introduced. (TCO)

35469 METHOD FOR PREVENTING THE LOWERING OF THE SENSITIVITY OF THE RADIATION IONIZING DETECTOR. Furukawa, Naohiko (to Mitsubishi Rayon Co., Ltd.). Japanese Patent 1965-29697. Dec. 21, 1964. Filed Mar. 31, 1961.

By the proposed method, the lowering of detector sensitivity when the carrier gas flow is small (less 20 ml/min) can be effectively prevented. Another gas, which can act as a carrier gas, is introduced, and the carrier gas, or the carrier gas containing the vapor of the sample, is diluted by the other gas. (TCO)

Inorganic and Physical Chemistry

35470 (AERE-R-4983) GALVANIC CELL FOR MEASURING THE URANIUM ACTIVITY IN CARBIDES AT HIGH TEMPERATURE. McIver, E. J. (Atomic Energy Research Establishment, Harwell (England)). Apr. 1966. 20p. Dep. BIS $0.60. HMSO 3s.

A high-temperature galvanic cell with a fused salt electrolyte was developed and used for measuring the U activity in uranium carbides. The free energy of formation of UC has been found to be, $\Delta G_{UC} = -20{,}300 - 1.6T°C$ calories and of UC_2 to be $\Delta G_{UC_2} = -24{,}200 + 0.9T°C$ calories. The dissolution of O_2 in UC_2 was found to lower its free energy of formation by as much as 5.4 kcals at 1000°K. (auth)

35471 (AWRE-O-31/66) THE THERMAL STABILITY OF METAL HYDRIDES. PART 2. SAMARIUM AND GADOLINIUM HYDRIDES. Jones, P. M. S.; Ellis, P.; Aslett, T. (Atomic Weapons Research Establishment, Aldermaston (England)). May. 1966. 24p. Dep. mn. BIS $0.70. HMSO 3s. 6d.

The plateau dissociation pressures of SmH_2 and GdH_2 were found to follow the equations, Sm: $\log_{10} p_{mm} = 8.616 \pm 0.040 - (9.393 \pm 0.120) \times 10^3/T°K$. Gd: $\log_{10} p_{mm} = 9.426 \pm 0.139 - (9.871 \pm 0.028) \times 10^3/T°K$. Calculated lattice energies of the rare earth series are included and the factors affecting the heats and entropies of formation discussed. (auth)

35472 (CONF-660606-12) THERMAL DECOMPOSITION OF PLUTONIUM PEROXIDE. Moseley, J. D.; Robinson, H. N. (Rocky Flats Div., Dow Chemical Co., Golden, Colo.). June 1966. Contract AT(29-1)-1106. 10p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From American Nuclear Society Meeting, Denver.

Experiments are described on thermal decomposition and conversion to oxide of plutonium peroxide. Conditions required to produce dry oxide reactive to hydrofluorination were investigated. Thermogravimetric analyses were used in the study. Optimum conditions were found for precipitation of plutonium peroxide from plutonium nitrate in a crystalline form that converts to PuO_2 at 300°C. (J.R.D.)

35473 (IS-T-41) CONDENSED PHASE AND VAPORIZATION EQUILIBRIA IN VANADIUM(II) HALIDE–IODINE SYSTEMS. Berry, Keith Oran (Ames Lab., Iowa State Univ. of Science and Tech.). May 1966. Contract W-7405-eng-82. 102p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Thesis.

Both preparative and vapor pressure investigations of the vanadium iodide system were made. Several different types of experiments were used in an attempt to prepare and isolate VI_3. They included: chemical transport reactions, equilibration experiments between VI_2 and liquid iodine, solvent extraction using liquid iodine for the solvent and direct combination of the metal (as foil) and iodine liquid. Equilibration experiments between VI_2 and liquid iodine produced compounds whose composition ranged from $VI_{2.00}$ to $VI_{2.63}$ in the temperature range from 495 to 722°C. Although VI_2 was found to have different lattice constants than any nonstoichiometric compound, all compounds within that phase range ($2.02 < I/V < 2.63$) had nearly the same lattice constants. Considering the nonstoichiometric phase to be a solid solution, equilibrium constants and associated thermodynamic data were calculated. The transpiration technique was used to study the reaction between vanadium(II) iodide and iodine vapor. The principal product was determined to be VI_4. The pressure of VI_4 resulting from this reaction was determined for the temperature range from 581 to 713°K. Equilibrium constants and associated thermodynamic data were calculated. The dissociation of the nonstoichiometric iodide was investigated using the diaphragm gage technique. A linear portion of that curve was abstracted and thermodynamic calculations made for the data within the temperature range from 388 to 546°K. The vaporization or equilibrium data obtained in this investigation may be expressed as $\log P$ (or K) $= -A/T + B$ for the following processes: $VI_2(s) + I_2(g) = VI_4(g)$; $VI_2(soln.) + \frac{1}{2}I_2(l) = VI_3(soln.)$; and $VI_{2+x}(s) = VI_2(s) + I_2(g)$. The values obtained for A and B, along with the temperature range and data are given. (auth)

35474 (IS-T-89) CRYSTAL STRUCTURE STUDIES OF SOME UNUSUAL ANTIMONY BROMIDE SALTS. Lawton, Stephen Latham (Ames Lab., Iowa State Univ. of Science and Tech.). May 1966. Contract W-7405-eng-82. 144p. Dep. mn. CFSTI $4.00 cy, $1.00 mn.

Thesis.

Jet black salts of the type $R_xSb_yBr_z$ were prepared to obtain information about the oxidation state(s) of antimony within them, the stereochemistry of the $SbBr_6^{n-}$ anions, and structural features associated with the charge transfer process. All cations used were monovalent, such as the ammonium ion, the quaternary ammonium ion and saturated and unsaturated protonated heterocyclic amines. Preliminary studies revealed that the cation has a strong influence on the ratio R : Sb : Br, its crystal structure, the stability of the salt with increasing temperature, and the color of the salt with decreasing temperature. Several of the salts become bright orange to red at or near liquid nitrogen temperature. The detailed crystal structures of two of these salts, $(NH_4)_4Sb^{III}Sb^{V}Br_{12}$ and $(C_5H_5NH)_6Sb^{III}Sb_3^{V}Br_{24}$, were solved by single crystal x-ray diffraction techniques. The final results of both determinations confirmed the presence of trivalent and pentavalent antimony rather than tetravalent antimony. The ammonium salt is a distorted K_2PtCl_6 structure with like-oxidation states of antimony repeating along the a- and b-directions of the tetragonal unit cell but alternating along the c-direction. It contains undistorted $Sb^{III}Br_6^{3-}$ ions (with O_h symmetry) and distorted $Sb^{V}Br_6^{-}$ ions (with D_{2d} symmetry). The pyridinium salt consists of $Sb^{III}Br_6^{3-}$ ions (with C_s symmetry) and two crystallographically independent $Sb^{V}Br_6^{-}$ ions (with C_s and Cy symmetry). The anions form two types of non-intersecting, approximately linear chains, one involving Sb(V) only and the other alternating Sb(III)-Sb(V) anions. (auth)

35475 (IS-T-93) EFFECTS OF ELECTRON CORRELATION IN X-RAY DIFFRACTION AND AN ELECTRON DIFFRACTION STUDY OF XeF_6. Gavin, Robert Michael Jr. (Ames Lab., Iowa State Univ. of Science and Tech.). May 1966. Contract W-7405-eng-82. 98p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Thesis.

The theory of x-ray diffraction by gas atoms was examined from the standpoint of one- and two-electron operators. Electron-nuclear D(r) and electron-electron P(r) radial distribution functions for some simple systems were investigated. A comparison of distributions calculated from both correlated and uncorrelated wave

functions indicated that P(r) functions are sensitive to the inclusion of electron correlation in the wave function, whereas D(r) functions are not. As a consequence, the total scattered intensity I_{tot}, which is related to P(r), is sensitive to effects of electron correlation whereas the elastic intensity, which is related to D(r), is not. For helium-like systems, the shifts in P(r) and I_{tot} due to electron correlation follow a regular trend with atomic number. A simple scheme for predicting these correlation shifts for more complex atoms was derived from the trends noted. Correlation shifts in P(r) and I_{tot} for the beryllium atom were predicted and the results compared with shifts calculated from correlated and uncorrelated wave functions. Agreement between predicted and calculated shifts was reasonably good. Radial distribution functions P(r) for neon and argon were derived from experimental x-ray intensities. The resulting distribution functions were used to calculate electron-electron potential energy values, V_{ij}. The V_{ij} for neon and argon calculated from the experimental data are 1.12 and 1.40 a.u., respectively. Corresponding values of 1.20 and 1.36 a.u. were obtained from Hartree-Fock wave functions. The P(r) functions compared favorably with those calculated from existing wave functions but experimental uncertainties were large enough to obscure effects of electron correlation. The structure of XeF_6 was investigated utilizing the sector-microphotometer method of electron diffraction. Results of the study indicated that the molecule is not a regular octahedron. The mean XeF bond length was 1.887 ± 0.005 Å and the mean amplitude of vibration was 0.070 ± 0.020 Å. The nature of the distortion from O_h symmetry is described. The fluorines on one side of the molecule are pushed apart and this deformation compresses the fluorines together toward the other side of the molecule. Three models, with symmetries C_{3v}, C_{2v}, and C_s, containing distortions of this form provide acceptable fits of the experimental data. (auth)

35476 (NASA-TN-D-3503) INFLUENCE OF TIME ON VACUUM VAPORIZATION RATE AND SURFACE COMPOSITIONAL STABILITY OF TANTALUM CARBIDE–HAFNIUM CARBIDE SOLID SOLUTIONS ABOVE 2000 DEG C. Deadmore, Daniel (National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center). July 1966. 17p. CFSTI $1.00 cy, $0.50 mn.

The vaporization rates of TaC, HfC, and of solid solutions of 80 TaC–20 HfC, 50 TaC–50 HfC, and 25 TaC–75 HfC were determined gravimetrically as functions of heating times from 5 to 70 hours in vacuum at 2060 to 2600°C. After the samples were heated, they were examined by x-ray diffraction, electron probe, and microscopic methods. For the tests at 2600°C the sublimates were collected and chemically analyzed. Up to 2600°C only HfC vaporized congruently. All compositions containing TaC vaporized incongruently with preferential loss of either C or Hf or both. In these materials the surface compositions changed, because the diffusion of the C and Hf to the surface was not as rapid as their volatilization. These composition changes extended to considerable distances below the surface. At constant temperature the vaporization rate of all compositions containing Ta decreased with time. This decrease in vaporization rate with heating time became less pronounced at higher temperatures. One explanation for the decrease in vaporization rate with time at constant temperature is that the C diffusion rate is less than the vaporization rate up to 2600°C. (auth)

35477 (NYO–2082-4) BEHAVIOR OF LIQUID AND SOLID GALLIUM ON MERCURY AT ROOM TEMPERATURE AND THE MECHANISM OF ITS DISSOLUTION. Grosse, A. V. (Temple Univ., Philadelphia, Pa. Research Inst.). Apr. 30, 1966. Contract AT(30-1)-2082. 48p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

It is shown that liquid Ga forms a lens or a blister on Hg at room temperature from which a steel-blue film spreads over the whole Hg surface. The time of dissolution for the same quantity of Ga in the same quantity of Hg is shorter the larger the Hg surface area. Simple diffusion theory describes the experimental results quantitatively, under the assumption that the Ga surface film provides a relatively constant Ga surface concentration and that Ga atoms diffuse into the body of the liquid from the entire surface area of the film. (auth)

35478 (NYO–3608-2) ION MOBILITY IN MOLTEN SALTS. Progress Report, September 1, 1965–May 31, 1966. Laity, Richard W. (Rutgers–The State Univ. of New Jersey, New Brunswick). June 1966. Contract AT(30-1)-3608. 18p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A survey of ideas and insights resulting from research on ion movement in molten salts is presented. Information is included on ion electrical mobility concepts, ion mobility dependence on temperature and pressure, effects of concentration on ion mobility in binary salts, and relations between the mobility of specific ions and similarly charged ions in the solvent. In research on ion electrical mobility, equations were developed to calculate transport numbers for cation transport in fused salts. Cation transport numbers for pure fused salts calculated by these equations are compared with values obtained in porous plug experiments. Other research is reported on charged porous plug experiments involving transport of an electrolyte through membranes under the influence of electric fields. Separate experiments were conducted with aqueous $CdCl_2$ and molten $PbCl_2$ using porous glass on which Pt is deposited to demonstrate the phenomenon. (J.R.D.)

35479 (ORNL-TM-1454) THERMOCHEMICAL ANALYSIS OF VAPOR PLATING PROCESSES. Fleming, J. D.; Robinson, W. C.; Leitten, C. F. Jr. (Oak Ridge National Lab., Tenn.). July 1966. Contract W-7405-eng-26. 28p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The thermochemical vapor deposition (CVD) process involves diffusion, adsorption, desorption, and chemical reaction, all of which are influenced by temperature, pressure, and gas composition. The complexity of the process makes a purely experimental study inadequate. Thermochemical calculations cannot be applied rigorously to most CVD systems but can be used to direct experimental work. The advantages and application of thermochemical calculations are discussed, and the basic equations used for determining parameters in CVD processes are presented. The calculation procedure and the type of data obtained from this type of procedure are illustrated by two examples, which were chosen from systems previously considered and developed at ORNL. An organized logical procedure for performing the pre-experimental screening of proposed systems is presented and the method used to interpret data for use in further experimental study is described. (J.R.D.)

35480 (ORNL-TM-1536) SURFACE CHEMISTRY AND VISCOSITY OF THORIA SOLS. McCorkle, Kenneth Hall (Oak Ridge National Lab., Tenn.). July 1966. Contract W-7405-eng-26. 348p. Dep. mn. CFSTI $7.00 cy, $1.75 mn.

Thesis. Submitted to Univ. of Tennessee, Knoxville.

The morphology of colloidal thoria particles was determined by x-ray line broadening and electron photomicrography. Hydrous thoria was found to be noncrystalline when first made and to consist of filaments 4 to 20 Å wide by 700 Å long and of spherical agglomerates of these strings. Amorphous thoria was found to crystallize spontaneously over a period of weeks to make centrosymmetric particles. Crystalline colloidal thoria particles in sols were shown to consist of single crystallites agglomerated weakly into elongated flocs, which are the hydrodynamically effective particles in viscometry. Adsorption data and electron photomicrography are most consistent with the hypothesis that the crystallites are irregular cubo-octahedra with both (111) and (100) faces developed about equally. The structure of thoria made by firing thorium oxalate was studied by pore condensation of adsorbed nitrogen. The data are most consistent with individual centrosymmetric crystallites being organized into thin parallel sheets within the relic particle. The previously reported superlattice was determined probably to be a misinterpretation of x-ray absorption dis-

continuities. The entire surface of the individual crystallite of colloidal thoria is accessible for adsorption if the maximum firing temperature in preparation does not exceed 800°C. Thoria surface has a capacity of 5.7×10^{-6} moles/m^2 for adsorption of nitric acid, which is half of the capacity expected from density of surface thorium ions of cubo-octahedral crystal faces. It is hypothesized that the discrepancy is due to steric hindrance of adsorbed nitrate. Adsorption of atmospheric carbon dioxide was a severe interference in nitric acid adsorption measurements, and probably is the origin of the discrepancies of the foregoing capacity with other published values. The free energy of desorption of nitric acid on thoria was variable, ranging from +10 kcal/mole at 0.007 mole ratio of adsorbed nitrate surface thorium ions to +5 kcal/mole at 0.48 mole ratio. The free energy is relatively constant in the mid range of the adsorbed acid to surface sites mole ratio. Variation in surface free energy is ascribed to differences in intrinsic energies of adsorption sites at low coverages but is tentatively hypothesized as being due to steric factors at high coverages. Data on nitric acid adsorption versus temperature permitted estimating the enthalpy of desorption to be +7 to +8 kcal/mole, and with the free energy the entropy of desorption was estimated to be +9 eu. This low entropy change implies little loss of freedom of an adsorbed surface nitrate. The suspension effect exerted by thoria sol on the junction diffusion potential at a KCl salt bridge was found to obey the ideal Donnan Equilibrium with all the adsorbed ion contributing. This result is not in agreement with published electrophoretic data for thoria, which places most of the adsorbed nitric acid in the Stem Layer instead of the Gouy Layer. Properties of thorium nitrate solutions determined are density, viscosity, conductance, and pH. A conductance of 72 mho-cm/equiv was determined for the Th^{4+} ion at 25°C. (auth)

35481 (ORO-2073-11) VISCOSITY AND RAMAN SPECTRA OF FUSED SALTS. Progress Report No. 11, December 1965–June 1966. (Southern Research Inst., Birmingham, Ala.). July 1, 1966. Contract AT(40-1)-2073. 13p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Additional viscosity data were obtained on two compositions in the $CdCl_2$–KBr system in order to confirm the appearance of a maximum in the viscosity isotherm near the equimolar composition. Viscosity data on a few compositions in the $CdCl_2$–KCl system were obtained, but they were of limited reliability. It was decided not to expend further effort on this system. An improvement is being made in the densitometric instrumentation for use with the Raman spectra in order to improve the signal-to-noise ratio and to establish the background correction more reliably. Raman spectra were obtained on solutions of $ZnCl_2$ in the KCl–LiCl eutectic mixture. Previous observations were confirmed. Spectra were also obtained on equimolar mixtures of ZnI_2 with KI, ZnI_2 with KCl, $ZnCl_2$ with KBr, and $ZnCl_2$ with KI. Interpretation of these spectra awaits completion of the densitometric instrumentation. (auth)

35482 (UCRL-16865) IMPROVED CORRELATION FOR THE HEATS OF FORMATION OF INORGANIC COMPOUNDS. Brelvi, Waseem (Lawrence Radiation Lab., Univ. of California, Berkeley). May 16, 1966. Contract W-7405-eng-48. 92p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Thesis.

An existing equation for estimating the standard heat of formation of solid inorganic compounds was improved. The original equation was derived from Linus Pauling's electronegativity scale. The present form of the equation involves four characteristic parameters for each valence state of an ion present in a compound. The parameters for any ion may be correctly evaluated if experimental heats of formation of at least four of its compounds are known. The equation was used to correlate the known heats of formation of a large number of solid inorganic and simple metallic organic compounds. Typical compounds are metallic halides, oxides, sulfides, sulfates, silicates, tungstates, molybdates, etc. The average deviation from experimental values in correlating the heats for 611 compounds was 2.09 kcal/M. Heats of formation predicted by the correlation were estimated to be reliable to ±13 kcal/M. Calculations based on the correlation led to a method of investigating any suspected errors in experimental data. Based on these calculations, it appears that the experimental heats of formation of Al_2S_3, $La(OH)_3$, and $FeCrO_4$ are seriously in error. (auth)

35483 (NP-tr-1389) INFRARED SPECTRA OF URANYL SALTS. Sevchenko, A. N.; Stepanov, B. I. Translated for U.K.A.E.A. Atomic Energy Research Establishment, Harwell, Eng., from Zh. Eksp. Teor. Fiz., 19: 1113-20 (1949). 8p. Dep. mn. CFSTI $1.00 cy, $0.50 mn. JCL $1.10 fs, $0.80 mf.

Results from an investigation of the absorption spectra of uranyl acetate, uranyl nitrate, uranyl potassium sulfate, and uranyl sulfate at 5 to 14μ are presented. Correlations of band intensities with the selection rules leads to the conclusion that the UO_2^{++} ion in uranyl sulfate and uranyl potassium sulfate has a nonlinear or bent form, but in uranyl acetate and uranyl nitrate it is almost linear. (J.R.D.)

35484 (UCRL-Trans-10027) A PROCESS FOR THE PREPARATION OF LARGE CRYSTALS. Kyropoulos, S. Translated for Univ. of California Lawrence Radiation Lab., Livermore), from Z. Anorg. Alg. Chem., 154: 308-13(1926). 11p. Dep. mn. JCL $1.60 fs, $0.80 mf.

A process is described for preparation of large uniform salt crystals from melts. The temperature of the melt is kept constant, and heat is withdrawn at one point by an immersed cooler, which is controlled in such a way as to induce the growth of single crystals. The process has been used for the preparation of NaCl, NaBr, KCl, KBr, KI, RbCl, and LiF crystals for optical, photoelectric, and dielectric investigations. (auth)

35485 RELATION BETWEEN THE ABSORPTION AND LUMINESCENCE SPECTRA OF URANIUM COMPOUNDS. Kozma, L. (Josef Attila Univ., Szeged). Acta Univ. Szeged. Acta Phys. Chem., 11: 29-33(1965). (In Russian).

An equation relating the intensity of absorption and luminescence with temperature was found to be valid for U glass and aqueous solutions of UO_2SO_4. Measurements of absorption and luminescence were made at 263, 298, 318, 338, and 363°K, using thick samples because of the low luminescence intensity. Figures illustrate the linear relation of absorption intensity and fluorescence with wave number between 1.95×10^4 cm^{-1} for U glass and the linearity of similar data for UO_2SO_4 from Stepanov's formula. These data were then used to calculate the temperature at which they had been measured, and agreement within 2 to 12° was found over the range for both solutions, the values being above the true values in all cases, with the U glass giving slightly more accurate values. (BBB)

35486 CHEMISTRY OF THE NOBLE GASES. Thomson, Bruce. Advance. Sci., 22: 208-17(Aug. 1965).

Recent developments in the chemistry of He, Ne, Ar, Kr, Xe, and Rn are reviewed, particularly in the formation of compounds by these rare gases. The first true compound of a noble gas, xenon hexafluoroplatinate, $Xe^+(PtF_6)^-$, was prepared in 1962. Later, it was found that xenon combined with other metal hexafluorides at room temperature according to the equation: $Xe + MF_6 = Xe^+(MF_6)$, where M = Pt, Pu, Ru, Rh. Xenon difluoride, XeF_2, was first noticed mass spectrometrically as an impurity in XeF_4 samples, but was soon produced quantitatively by uv photolysis of xenon and fluorine. Fluorides of the other noble gases were formed soon after the isolation of XeF_2 and XeF_4, but the most stable rare gas fluoride to date is XeF_4. Attempts to prepare the oxides by synthesis from the elements proved impossible. Xenon trioxide, XeO_3, was first obtained as the dangerously explosive, nonvolatile, hydrolysis product of XeF_4. Reactions of some of the xenon compounds are considered. (TCO)

35487 EMISSION INTENSITY OF STRONTIUM AND BARIUM IN FLAMES OF VARIOUS GAS COMPOSITIONS. Andersen, Neil R.; Hume, David N. (Woods Hole Oceanographic Inst., Mass. Massachusetts Inst. of Tech., Cam-

bridge). Anal. Chim. Acta, 35: 441-6(Aug. 1966). (MIT-905-49).

The emission intensity of strontium at 460.7 mμ and barium at 553.6 mμ was studied in hydrogen flames burning with varying mixtures of oxygen and nitrogen. With solutions of barium and strontium chloride in water and in various concentrations of EDTA, acetic, and hydrochloric acids, it was found that the emission depended significantly on the oxygen:nitrogen ratio in the atomizing gas. Under some conditions, maximum emission intensity was found at compositions intermediate between air and pure oxygen. The emission of barium was found to be decreased significantly by EDTA at high pH under some flame conditions. (auth)

35488 SERIES OF HALOGENOSULFIDES OF LANTHANUM AND CERIUM. Dagron, Christian (Faculte de Pharmacie, Paris). Compt. Rend., Ser. C, 262: 1575-6 (June 1, 1966). (In French).

The progressive combination of a halogen, then of a sulfide near 500°C with cerium or lanthanum made it possible to prepare the compounds CeSI, LaSI, CeSBr, LaSBr, CeSCl, and LaSCl. The x-ray-diffraction spectra show that all these compounds have the same crystalline type corresponding to the P cab group of the orthorhombic system. The dimensions of each lattice were calculated. (tr-auth)

35489 CONTRIBUTION TO THE STUDY OF THE IONIZATION OF CHROMIUM FLUORIDE AND CERIUM OXIDE IN DIFFERENT FUSED ALKALINE FLUORIDES AND CHLORIDES. Mergault, Pierre; Garbarz-Olivier, Jocelyne (Laboratoire de Physique-Enseignement, Paris). Compt. Rend., Ser. C, 262: 1631-4(June 13, 1966). (In French).

If cerium oxide, CeO_2, is added to a solution of CrF_3 in fused NaF, LiF, NaCl, or KCl, a double decomposition reaction is produced which yields Cr_2O_3 and cerium fluoride. However, this reaction is always incomplete and leads with difficulty to cerium chromite only in the case where the solvent is NaF (only a very slight amount of chromite is produced). Moreover, the reaction is accompanied by an oxidation reduction reaction with Ce^{4+} passing to the Ce^{3+} state which can be interpreted by assuming a release of oxygen or fluorine. (tr-auth)

35490 CHEMICAL SHIFTS OF ^{59}Co IN SOME AQUOCOBALTIC COMPLEXES. Biradar, N. S.; Pujar, M. A. (Karnatak Univ., Dharwar, India. Tata Inst. of Fundamental Research, Bombay). Curr. Sci. (India), 35: 385-6(Aug. 5, 1966).

The nuclear magnetic resonance of ^{59}Co in cobalt complexes was studied. Shift measurements were made in aqueous solutions and compared with shifts calculated by ligand field theory. The shifts of NMR for $[Co(NH_3)_6]Cl_3$, $[Co(NH_3)_x(H_2O)_y]Cl_2$, or $[Co(NH_3)_x(H_2O)_y]SO_4$ relative to $K_3Co(CN)_6$ were determined. Replacement of the ammonia ligand by water resulted in an increase in shift. It was concluded that the main contribution to these shifts arises from the second-order paramagnetic term. (M.C.G.)

35491 RARE-EARTH PERCHLORATE ADDUCTS WITH DIMETHYL FORMAMIDE. Krishnamurthy, S. S.; Soundararajan, S. (Indian Inst. of Science, Bangalore, India). Curr. Sci. (India), 35: 389-90(Aug. 5, 1966).

Six complexes of rare earth perchlorates with dimethyl formamide (DMF) were prepared and characterized. They conformed to the formula $M(DMF)_8(ClO_4)_3$, where M is La, Ce, Pr, Nd, Sm, or Y. The complexes were soluble in polar solvents and insoluble in nonpolar solvents. They behaved as 1:3 electrolytes in nitromethane. (M.C.G.)

35492 SAMPLING CALCINER OFF-GAS FOR RADIOACTIVE RUTHENIUM USING A POLYETHYLENE ABSORBER. Jenson, Denzel K. (Phillips Petroleum Co., Idaho Falls, Idaho). Health Phys., 12: 923-6(July 1966). (CONF-650616-24).

An absorber for sampling gaseous radioactive ruthenium in the off-gas was developed and used throughout the first production run in the Waste Calcining Facilities at the Idaho Chemical Processing Plant. This absorber sampler consisted of a glass cartridge packed with ASTM type II polyethylene pellets. The pellets collected ruthenium and held it tenaciously. The amount of ruthenium on the sample was easily determined by gamma counting. Continuous radiation field measurements from the absorber as the sample was being collected provided constant monitoring of the WCF off-gas radioactivity level. Performance of the absorber sampler was evaluated throughout 10 months of operation. No species of ruthenium were found to pass through the absorber without being collected. The concentrations of ruthenium in the off-gas did not have an effect on the collection efficiency. However, the amount of ruthenium collected above 1 μg of ruthenium per g of polyethylene reduced collection efficiency approaching saturation at 3 μg/g. Temperature was found to have a definite effect on absorber efficiency. Ruthenium-106 levels measured in the off-gas can be correlated with WCF operating data. The measurement of ruthenium discharged was supported by analyses of environmental airborne particulate and vegetation samples. It is concluded that the system is satisfactory and adequate for WCF off-gas ruthenium sampling. (auth)

35493 REACTION OF MOLTEN MAGNESIUM CYCLOPENTADIENIDE WITH FLUORIDES AND OTHER METAL HALIDES. Reid, A. F.; Wailes, P. C. (CSIRO, Melbourne). Inorg. Chem., 5: 1213-16(July 1966).

Molten magnesium cyclopentadienide in the absence of solvent reacts with a large number of metal halides, and in particular fluorides, to give cyclopentadienyl metal compounds, frequently in good yield. The reaction is particularly suited to the preparation of the cyclopentadienyls of thorium, uranium, scandium, and the rare earths from their fluorides, which are readily accessible and relatively stable to moisture. (auth)

35494 HYDROTHERMAL PRECIPITATION OF URANIUM DIOXIDE FROM URANYL NITRATE SOLUTIONS. Robins, R. G. (Univ. of New South Wales, Kensington, Australia). J. Appl. Chem. (London), 16: 187-90(June 1966).

Uranium dioxide of high purity was precipitated directly from acid uranyl nitrate solutions by hydrogen in a stainless steel autoclave at temperatures in the region of 300°C and pressures up to 40 atmospheres. Thermodynamics of the reaction are discussed. (auth)

35495 HYPERFILTRATION STUDIES. III. EFFECT OF CERTAIN METAL IONS ON THE SALT FILTRATION PROPERTIES OF CELLOPHANES. Kuppers, J. R.; Harrison, Neva; Johnson, James S. Jr. (Oak Ridge National Lab., Tenn.). J. Appl. Polymer Sci., 10: 969-79(July 1966). (ORNL-P-2015).

The salt rejection properties of cellophanes were substantially increased, and permeation rates decreased, by pretreatment with certain metal ions or presence of these ions at low concentration in feed solutions. In a typical case, a cellophane that initially rejected about 20% of salt from a 0.05M NaCl solution rejected over 70% in presence of 10^{-3}M $ThCl_4$. Permeation rates were decreased, usually by a factor of 2 or 3. Additives found to have a marked effect were Fe(III), Th(IV), U(VI), Cu(II), Zr(IV), and hydrolyzed Pb(II). Mg(II), Ba(II), La(III), and unhydrolyzed Pb(II) had little effect. The mechanism by which the additives affect the cellophane is not clear. (auth)

35496 THE PHOTOCHEMICAL REACTION OF XENON WITH FLUORINE AT ROOM TEMPERATURE: A DEMONSTRATION OF THE REACTIVITY OF XENON. Holloway, John H. (Univ. of Aberdeen, Scotland). J. Chem. Educ., 43: 202-3(Apr. 1966).

Products of the photochemical reaction between xenon and fluorine in Pyrex bulbs at room temperature and atmospheric pressure and in diffuse daylight or bright sunlight, were studied. Previous experiments showed that, when fluorine is present in excess, although xenon tetrafluoride is produced, it is not the inevitable product of the reaction. Various mixtures of xenon and fluorine were allowed to react in a Pyrex bulb, and mass spectra of the

least volatile samples in the bulb showed the fragmentation pattern characteristic of xenon difluoride. Infrared spectra of the vapor phase of the least volatile species present in the bulbs showed the characteristic peaks associated with xenon difluoride. No peaks corresponding with those of other known xenon fluorides or oxide fluorides were observed. The evidence thus shows that xenon difluoride is the only xenon-containing product of the reaction. (TCO)

35497 ISOTOPE EXCHANGE RATES. III. THE HOMOGENEOUS FOUR-CENTER REACTION $H_2 + D_2$. Bauer, S. H.; Ossa, Eugenio (Cornell Univ., Ithaca, N. Y.). J. Chem. Phys., 45: 434-43 (July 15, 1966). (TID-23199).

The homogeneous isotopic exchange reaction between hydrogen and deuterium in an excess of argon was studied in a 1-in.-dia single-pulse shock tube. Reaction times behind the reflected shock were close to 1 msec and the temperature range was 1060 to 1420°K. The hydrogen and deuterium were present in concentrations from 1 to 10%, at total reaction densities of 1.18 to 5.31×10^{-2} mole/liter. Conversions were kept low in order to minimize the reverse reaction. From the average rates the reaction was found to be second order (total) and empirically represented by $\Delta[HD]/\Delta t = k_p[Ar]^{0.98}[D_2]^{0.66}[H_2]^{0.38}$, $k_p = 10^{12.84}T^{\frac{1}{2}} \exp(-42\ 260/RT)$, $cm^3 mole \cdot sec^{-1}$. This power-rate law, with asymmetry in the $H_2 - D_2$ dependence, can be rationalized by assuming that exchange occurs with high probability only during encounters between $H_2 - D_2$ pairs, one of which is vibrationally excited to approximately 30 kcal/mole; that the probability for metathesis is low between molecules in their low-lying vibrational states even when their relative kinetic energy along the line of centers plus vibrational excitation exceeds the activation energy. Support for this mechanism is provided by an approximate calculation of the pre-exponential term of the exchange rate constant from vibrational relaxation data. (auth)

35498 ISOTOPE EXCHANGE RATES. IV. THE HOMOGENEOUS REACTION BETWEEN CH_4 AND D_2. Watt, W. S.; Borrell, Peter; Lewis, David; Bauer, S. H. (Cornell Univ., Ithaca, N. Y.). J. Chem. Phys., 45: 444-50 (July 15, 1966). (TID-23220).

The rate of exchange of deuterium for hydrogen in the homogeneous gas-phase reaction between D_2 and CH_4 (highly diluted in argon) was measured behind reflected shocks in a single-pulse shock tube of the "magic hole" design. The studies covered the temperature range from 1440 to 1755°K, at CH_4/D_2 ratios from 0.1 to 3.0. The exchange rate was found to be approximately first order with respect to deuterium and one-half order with respect to methane and argon. The empirical rate expression and the measured exchange rates can not be accounted for either by a direct four-center bimolecular exchange process or by a mechanism involving a dissociation followed by a chain of atom displacement steps. However, these results are readily accounted for by a vibrational excitation mechanism in which the exchange rate is limited by the rate of populating a critical vibrational level for D_2 (approximately the fifth). The activation energy for exchange is 52.0 ± 2.2 kcal/mole. (auth)

35499 ABSORPTION SPECTRA OF GASEOUS $NdBr_3$ AND NdI_3. Gruen, D. M.; DeKock, C. W. (Argonne National Lab., Ill.). J. Chem. Phys., 45: 455-60 (July 15, 1966).

Absorption spectra were obtained of gaseous $NdBr_3$ and NdI_3 in the range 4000 to 25,000 cm^{-1} between 1000 and 1200°C. Spectra of solid and liquid NdI_3 near the melting point were also measured. The most prominent feature of the gaseous spectra was a complex band located between 16,000 and 17,000 cm^{-1} with oscillator strengths of 3.3×10^{-4} and 5.3×10^{-4} for $NdBr_3$ and NdI_3, respectively. The band is assigned to the hypersensitive transition $^4I_{\frac{9}{2}} - {}^4G_{\frac{5}{2}}$. The oscillator strength of this transition in the vapor molecules was 10 to 50 times greater than in the solution systems studied by Carnall, Fields, and Wybourne. Various intensity mechanisms are discussed and it was concluded that the vibronic mechanism gives order-of-magnitude agreement with results. Judd's proposal that the parameter T_2 is particularly sensitive to environment was borne out by the results on the vapor spectra. (auth)

35500 ENERGY LEVELS OF SINGLE-CRYSTAL ERBIUM OXIDE. Gruber, John B. (Univ. of California, Los Angeles); Henderson, J. R.; Muramoto, M.; Rajnak, K.; Conway, John G. J. Chem. Phys., 45: 477-82 (July 15, 1966).

Absorption spectra of large single crystals of Er_2O_3 observed at 10, 80, and 290°K were analyzed in the 2200 to 10,000Å wavelength region. Over 600 transitions from all eight crystalline Stark levels of the ground $^4I_{15/2}$ state to over 30 excited J manifolds of the Er^{3+} ion in C_2 sites were assigned. In thick crystals, evidence of vibronic spectra of ions in C_2 and S_6 sites was observed for seven J manifolds. The observed spectrum was compared with a calculation that includes configuration-interaction effects on all expected "free-ion" energy levels of Er^{3+} between the ground state and 44,000 cm^{-1}. The parameters $E^1 = 6844$, $E^2 = 32.04$, $E^3 = 635$, $\zeta = 2354$, $\alpha = 12.2$, $\beta = -590$, and $Y(22, 1) = -4180$ cm^{-1} yielded an rms deviation of 73 cm^{-1} between observed and calculated energy levels. The significance of these parameters in comparison with those for Er^{3+} in other crystals is discussed. (auth)

35501 VIBRATIONAL-ROTATIONAL STUDY OF THE ELECTRONIC GROUND STATE OF THE HYDROGEN MOLECULE. Wolniewicz, L. (Univ. of Chicago). J. Chem. Phys., 45: 515-23 (July 15, 1966).

The Schrödinger equation for nuclear motion in H_2, HD, and D_2 was integrated numerically with accurate internuclear potential for numerous vibrational and rotational states. The theoretical dissociation energies are larger than the experimental results by 3.9, 4.7, and 3.6 cm^{-1} for H_2, HD, and D_2, respectively. It is argued that this discrepancy exceeds the possible computational inaccuracies and is not due to the adiabatic approximation. The radiative corrections are also discussed and show that the correction to the dissociation energy is definitely smaller in absolute value than 0.4 cm^{-1}. The computed vibrational quanta are larger than the observed ones by about 1 cm^{-1} while the theoretical rotational quanta are in a very good agreement with experiment. The vibrational-rotational wavefunctions are used for averaging of some electronic expectation values. The computed quantities agree with experiment within the experimental errors. (auth)

35502 COMPARISON OF THE INFRARED SPECTA OF THE HYDRATES AND ANHYDROUS SALTS IN THE SYSTEMS $UO_2(NO_3)_2$ AND $Th(NO_3)_4$. Ferraro, J. R.; Walker, A. (Argonne National Lab., Ill.). J. Chem. Phys., 45: 550-3 (July 15, 1966).

The infrared spectra from 4000 to 80 cm^{-1} of the hydrates and anhydrous salt of $UO_2(NO_3)_2$ and $Th(NO_3)_4$ were obtained. The change in symmetry of the nitrate group is followed and discussed, and metal-to-coordinated-nitrate assignments are made. (auth)

35503 URANIUM MONONITRIDE: HEAT CAPACITY AND THERMODYNAMIC PROPERTIES FROM 5 DEG TO 350 DEG K. Westrum, Edgar F. Jr.; Barber, Carolyn M. (Univ. of Michigan, Ann Arbor). J. Chem. Phys., 45: 635-9 (July 15, 1966).

The low-temperature heat capacity of UN was determined by adiabatic calorimetry and found to have a normal sigmate temperature dependence, except for the presence of an anomaly near 52°K associated with antiferromagnetic ordering of the electron spins. At 298.15°K the heat capacity (C_p), entropy (S°), enthalpy function $[(H^\circ - H_0^\circ)/T]$, and Gibbs energy function $[-(G^\circ - H_0^\circ)/T]$ are, respectively, 11.43, 14.97, 7.309, and 7.664 cal/(gfm · °K). (auth)

35504 NEUTRON SCATTERING FROM ORIENTED POLYETHYLENE. Trevino, S. F. (Picatinny Arsenal, Dover, N. J.). J. Chem. Phys., 45: 757-9 (July 15, 1966).

Neutron scattering from oriented polyethylene was studied using the time-of-flight spectrometer at the

AMRA reactor. On the basis of the measurements the high-frequency limits of the two lowest-frequency chain modes ν_5 (in plane skeletal deformation) and ν_9 (out of plane torsion) was assigned as 530 ± 15 cm^{-1}, respectively. Lattice vibrations occurred below ν_9. The high-energy modes corresponded to antiparallel rotary oscillations about the chain axis and translatory vibrations of the chain perpendicular to the axis. The lowest-energy lattice mode, antiparallel translatory vibrations parallel to the chain, was predicted near 60 cm^{-1}, which may explain the overall lower value of the cross section for parallel orientation. Perpendicular polarization vectors were predicted for both of these modes. Results are compared with previous investigations. (P.C.S.)

35505 COMMENT ON THE FLUORESCENCE OF TRIVALENT EUROPIUM IN D_2O–H_2O MIXTURES. Kropp, John L.; Windsor, Maurice W. (TRW Systems, Redondo Beach, Calif.). J. Chem. Phys., 45: 761-2(July 15, 1966).

Terminology is more clearly defined for reported results on the fluorescence of Eu^{3+} in D_2O–H_2O mixtures. Similarities and discrepancies with P.K. Gallagher's results (J. Chem. Phys. 43: 1742(1965)) are discussed. Further study, together with more recent data on the lifetimes of rare earth ions in D_2O and H_2O solutions containing acetate ions, still did not detect any short-lived component with a lifetime longer than 20 μsec. Sensitivity differences between the flash lamp technique and the stroboscopic technique (used by Gallagher) can not explain this discrepancy. (P.C.S.)

35506 ELECTRON TRANSFER SPECTRA OF SOME SOLID LANTHANIDE(III) COMPLEXES. Barnes, John C.; Pincott, Hugh (St. Andrews Univ., Dundee, Scotland). J. Chem. Soc. (A), No. 7, 842-5(1966).

Electron transfer spectra are reported for the compounds $LnPO_4$, $Ln_2(CO_3)_3$, $3H_2O$, $Ln_2(oxalate)_3$, $10H_2O$, and several compounds containing sulfate or halide ions (Ln = Sm, Eu, and Yb). The shifts in the band positions correlate with the number of coordinated ligands. All oxygen donors of the type AO_n^{x-}, (sulfate, selenate, etc.) show similar optical electronegativities. The ytterbium spectra are sometimes difficult to correlate with those of the other metals because of changes in coordination sphere. Electron transfer spectra of lanthanide halides do not always show the same halide dependence as transition-metal spectra. (auth)

35507 PROTACTINIUM(V) CHLORIDES. Brown, D.; Jones, P. J. (Atomic Energy Research Establishment, Harwell, Eng.). J. Chem. Soc. (A), No. 7, 874-8(1966).

Protactinium pentachloride is best prepared by reaction of low-fired or vacuum-dried pentoxide with thionyl chloride vapor at 375–425°C or, mixed with carbon, chlorine, and carbon tetrachloride vapor at 400–500°C. Diprotactinium(V) oxyoctachloride, Pa_2OCl_8, which occurs as a by-product of the latter reaction, is also obtained by heating the pentachloride with the stoichiometric quantity of oxygen at 400°C. It disproportionates above 270°C in a vacuum, forming the pentachloride and the non-volatile diprotactinium(V) trioxytetrachloride, $Pa_2O_3Cl_4$, which in turn disproportionates above 520°C in a vacuum to form $PaCl_5$ and protactinium(V) dioxymonochloride, PaO_2Cl. By varying the conditions, the reaction between $PaCl_5$ and oxygen can also be made to yield pure samples of diprotactinium(V) trioxytetrachloride, and an unstable oxytrichloride, $PaOCl_3$, has also been observed. Some chemical properties, x-ray-diffraction studies, and infrared spectra are reported for these compounds. (auth)

35508 SULFUR ISOTOPE CHEMISTRY OF POLYSULFIDE SOLUTION. KINETIC ISOTOPE EFFECT IN THE THIOCYANIDIZATION. Sakai, H. (Okayama Univ., Japan). J. Inorg. Nucl. Chem., 28: 1567-73(Aug. 1966).

The kinetic isotope effect in S–S bond rupture in the reaction, $S_n'' + (n-1)CN' = S'' + (n-1)SCN'$, was estimated to be 1.022 at 24.8°C, the lighter isotope, ^{32}S, leaving the polysulfide chain faster than the heavy one, ^{34}S. The enrichment of the heavy isotope in the polysulfide and sulfide ions during the fractional removal of the polysulfidic sulfur is discussed in terms of the kinetic isotope effect and the isotope equilibrium between the polysulfide and sulfide ions. It is apparent from the results that the rate determining process of the reaction should involve the rupture of S–S bond. (auth)

35509 THERMOGRAVIMETRY OF THE OXALATE HYDRATE OF THE RARE EARTH METALS. Moebius, R.; Matthes, F. (Technische Hochschule, Merseburg, Ger.). J. Inorg. Nucl. Chem., 28: 1601-7(Aug. 1966). (In German).

Thermal dissociation of the oxalate hydrates of the rare earths was investigated under various conditions. The results show that the form of the curves obtained and the range of existence of intermediary products depends markedly on the heating velocity of the samples. (auth)

35510 DIMETHYL FORMAMIDE COMPLEXES OF RARE EARTH NITRATES. Krishnamurthy, S. S.; Soundararajan, S. (Indian Inst. of Science, Bangalore). J. Inorg. Nucl. Chem., 28: 1689-92(Aug. 1966).

Dimethyl formamide complexes of 5 rare earth nitrates $M(DMF)_4(NO_3)_3$ where M = La, Pr, Nd, Sm, or Y were prepared and their infrared spectra and conductivities in nitromethane and DMF were studied. The coordination number of the metal ion in these complexes is discussed. (auth)

35511 PREPARATION OF α-UO_3 BY HIGH-TEMPERATURE HYDROLYSIS OF URANYL HALIDES. Coenen, F. (CEN-SCK, Mol, Belg.). J. Inorg. Nucl. Chem., 28: 1733-4 (Aug. 1966).

Preparation of α-UO_3 by the high-temperature hydrolysis of UO_2F_2 and UO_2Cl_2 was studied. Thermal stability and diffraction patterns of the compound were in agreement with data for orthorhombic U_3O_8. At 660°C hydrolysis of UO_2F_2 resulted in a black product with an O/U ratio of 2.68. Uranyl chloride formed $UO_{2.9}$ at 520°C. At lower temperature the reaction product was a mixture of α-UO_3 and $UO_{2.9}$; the latter was formed by decomposition of initially formed amorphous UO_3. (P.C.S.)

35512 ELECTROCHEMISTRY OF PLUTONIUM(III) IN MOLTEN ALKALI CHLORIDES. Nissen, D. A. (Battelle Memorial Inst., Richland, Wash.). Contract AT(45-1)-1830. J. Inorg. Nucl. Chem., 28: 1740-3(Aug. 1966).

Chronopotentiometric techniques were used to study the reduction of Pu(III) to the metal in the eutectic LiCl–KCl system at temperatures from 400 to 600°C. A postulated mechanism for the cathodic reduction of Pu(III) as well as information on the diffusion properties of Pu(III) in molten LiCl–KCl are presented. (P.C.S.)

35513 MOLECULAR WEIGHT DETERMINATIONS OF EUROPIUM TRIS AND TETRAKIS β-KETOENOLATES IN ORGANIC SOLVENTS. Filipescu, N. (George Washington Univ., Washington, D. C.); Hurt, C. R.; McAvoy, N. J. Inorg. Nucl. Chem., 28: 1753-6(Aug. 1966).

Molecular-weight determinations of Eu β-ketoenolates were carried out in benzene, chloroform, and acetonitrile by varying the chelate concentration between 0.005 to 0.02 molar. The piperidinium tetrakis (β-ketoenolate) chelates (EuL_4P) have two most probable ways of dissociation in solution: $EuL_4 \rightleftharpoons EuL_3 + LP$ (homolytic) and $EuL_4P \rightleftharpoons EuL_4^- + P^+$ (heterolytic). No differentiation between the two could be made by molecular-weight determinations. However, the increase in conductivity of pure solvents of high dielectric constant (acetonitrile, dimethylformamide) on addition of EuL_4P showed preferential ionic dissociation in polar solvents. Some dissociation of the tetrakis chelates took place in nonpolar solvents as well. Homolytic cleavage was assumed to predominate in such cases. It was concluded that the most efficient Eu chelate laser to date reported by Samelson et al. (Appl. Phys. Letters, 5: 173(1964)) is a production of dissociation, very probably $EuBt_4$. (P.C.S.)

35514 DISSOCIATION OF ACETIC ACID-d_4 IN DEUTERIUM OXIDE FROM 5 TO 50 DEG AND RELATED ISOTOPE EFFECTS. Paabo, Maya; Bates, Roger G.; Robinson, R. A. (National Bureau of Standards, Washington, D. C.). J. Phys. Chem., 70: 2073-7(July 1966).

The dissociation constant of acetic acid-d_4 (CD_3COOD)

in deuterium oxide (D_2O) was determined by the emf method at ten temperatures from 5 to 50°C. From the variation of the dissociation constant with temperature, the changes of enthalpy, entropy, and heat capacity were derived. The four dissociation processes, those for ordinary acetic acid in ordinary water, for deuterioacetic acid in ordinary water, and for these two acids in deuterium oxide, are compared. (auth)

35515 SOLVENT EFFECT ON ISOTOPE EXCHANGE REACTIONS. V. KINETICS AND MECHANISM OF IODINE EXCHANGE BETWEEN ELEMENTARY IODINE AND 1-PHENYL-2,3-DIMETHYL-4-IODOPYRAZOLONE. Koroes, Endre; Pataki, Laszlo; Ladanyi, Laszlo; Orban, Miklos. Magyar Kem. Foly., 72: 130-5(Mar. 1966). (In Hungarian).

The kinetics of the iodine exchange was studied in carbon disulfide, benzene, ethanol, and water. In the organic media the rate equations may be described by the expression $v = k[I_2]^{\alpha}[IAp]$, where α has a value between 2.3 and 2.8; in water, however, $v = k_1[I_2] + k_2[I_2]^2$. From the temperature dependence of the rate constant the enthalpy and entropy of activation were calculated. A probable mechanism for the exchange is suggested. (auth)

35516 LUMINESCENT ORGANIC COMPLEXES OF THE RARE EARTHS. Crosby, G. A. (Univ. of New Mexico, Albuquerque). Mol. Crys., 1: 37-81(Jan. 1966).

A review, with 106 references, is given on the following aspects of this field: luminescence originating from intra-4f transitions (paths of energy migration, rate and mechanism of energy transfer); bonding; the chelate laser; search for new luminescent materials; structural investigations (spectroscopic studies of solids, solutions, and plastics); quenching; and the design of luminescent materials. Three paths have been proposed for the energy transfer process by which the excitation energy absorbed in the π-π^* electronic bands of the ligands migrates to the resonance 4f electronic levels of the ions. The weight of evidence in the literature favors a pathway in which the energy migrates from the triplet manifold of the complex to the rare earth ion levels and against a singlet transfer: however, there seems to be no a priori reason that singlet transfer could not occur, and there is no reason for believing that in some complexes, owing to the electronic structure of the organic ligand vis-a-vis the rare earth ion, singlet transfer may be more important than triplet transfer. Present knowledge concerning quenching in rare earth complexes is summarized. The bulk of the experimental evidence has been interpreted to mean that the primary mechanism for radiationless degradation of the energy stored on the central-metal ion in a chelate is through a vibronic interaction with the ligand and thence to the solvent. (BBB)

35517 CHEMISTRY OF THE RARE EARTH METALS. X. COMPLEX COMPOUNDS OF LANTHANUM WITH MALIC ACID. Brezina, Frantisek (Palacky Univ., Olomouc, Czech.). Monatsh. Chem., 97: 281-6(1966). (In German).

The system $LaCl_3$-$C_4H_6O_5$-KOH was studied. Compounds isolated and analyzed include LaH_3M_2 ($M = C_4H_3O_5$), soluble in H_2O, converted to a poorly soluble (1.91×10^{-3} mole/l at 25°C) form on prolonged heating on the steam bath; $La_2H_3M_3.5H_2O$, from mixing $K_2C_4H_4O_5$ and $LaCl_3$, solubility 1.04×10^{-3} mole/l at 25°C; $LaM.3H_2O$, solubility 0.93×10^{-3} mole/l at 25°C. No compounds were found in the acid region of the pH scale. Freshly precipitated $La_2H_3M_3$ is soluble in K_2HM; treatment of the resulting solution with methanol gave the compound $K_5LaH_4M_4.H_2O$. A Debyeogram of LaH_3M_2 is tabulated; the other compounds were amorphous. Thermogravimetric data are presented for the first three compounds. Dehydration is complete in $La_2H_3M_3$ at 85°C; in $LaM.3H_2O$, two H_2O are removed at 145°C. In LaH_3M_2 decomposition begins at 107°C, with further strong decomposition at 242°C; there are three waves, of which the last is decomposition of the inorganic residue. Pyrolysis of $La_2H_3M_3$ occurs in two waves at 140 and 195°C; $LaM.H_2O$ decomposes in one wave at 180°C. Infrared absorptions are tabulated. In LaH_3M_2, most of the carboxyls are dissociated; in the other compounds all carboxyls are dissociated. The spectrum of $K_5LaH_4M_4.H_2O$ shows that K_2HM is not a component of it. (BBB)

35518 VALENCE BOND FORMATION IN THE CLOSE-PACKED RARE EARTH METALS. Carter, Forrest L. (Naval Research Lab., Washington, D. C.). pp 103-13 of Solid State Session P-1. Book Two [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

A modified valence-bond treatment of the close-packed metals was developed subject to the restrictions that: (1) all near neighbors are bound simultaneously, (2) equivalent atoms form equivalent bonds, and (3) certain periodic boundary conditions. The use of bidirectional orbitals having the general characteristics $ap_x + \sqrt{1 - a^2}d_{xy}$ gives rise to various "phase structures" involving "cycles" of old VB theory. In the ccp and hcp structures this leads to a natural division of the electrons and orbitals into those associated with (1) a band of covalent bonds, (2) a MO band having s-character for free electrons and (3) localized orbitals not directed toward near neighbors and suitable for containing unshared electrons. In the ccp structure the pertinent orthonormal set of bonding orbitals contains 50% d character ($a = 1/\sqrt{2}$) whereas in the hcp the p and d character of the bidirectional orbital can change, giving rise to a variation of C/A with d character. At d character of ca. 58% the C/A value has a minimum of approximately 1.54 and rises to the ideal C/A = 1.63 at a d character of 50% and 67%. The trivalent rare earth metals form a near ideal system to test these ideas inasmuch as the local states of s, p, or d character are unoccupied and the three electrons per atom appear to be involved primarily in the covalent band rather than a free electron band. The presence of both hexagonal and cubic closest packing in the light (Ce → Sm) rare earth metal structures is in accord with the observed C/A of ca. 1.62 and percent d character of ca. 50% in the bifurcated bonding orbitals. Thereafter the observed C/A drops to a minimum near Er and starts to rise again at Lu. The general behavior is the same as indicated by the theory for increasing amounts of d participation in the bonding orbitals. The latter is expected to occur with increasing atomic number because the d energy levels fall more rapidly than the p levels and are accordingly used to a greater extent in (shared electron) orbital occupation. (auth)

35519 INFRARED ABSORPTION SPECTRA OF RARE EARTH BORATES. Laperches, J. P.; Tarte, P. (Univ., Liege). Spectrochim. Acta, 22: 1201-10(July 1966). (In French).

The infrared spectra of either trivalent cations or rare earth borates related to the calcite, the aragonite, and the vaterite structures were studied in the 1500 to 250 cm^{-1} region. The infrared pattern given by the rare earth borates of the YBO_3 type cannot be reconciled with a three-fold coordination, but instead points to a four-fold coordination of boron, a fact in contradiction with the alleged vaterite structure of these borates. The low-frequency spectrum is strongly structure-dependent, and is clearly influenced by the coordination number of the trivalent cation. The strong band observed in this region may be assigned to a cation-oxygen vibration, or possibly (for the calcite or aragonite-type borates) to a libration of the borate anion. Some significant discrepancies between these results and some data recently published in the literature are found to be related to spurious effects, such as the granulometry of the sample and possibly orientation effects. (auth)

35520 BOND ORIENTATIONS IN URANYL NITRATE HEXAHYDRATE USING ATTENUATED TOTAL REFLECTION. Deane, A. M.; Richards, E. W. T.; Stephen, I. G. (Atomic Energy Research Establishment, Harwell, Eng.). Spectrochim. Acta, 22: 1253-60(July 1966).

Bond orientations in uranyl nitrate hexahydrate were measured using polarized infrared radiation and the technique of attenuated total reflection. The technique of using polarized radiation with attenuated total reflection is discussed and the results used to produce a model in agreement with x ray data. (auth)

35521 INFRARED SPECTROSCOPY OF ETHYLENE AND HYDROGEN ADSORPTION ON YTTRIUM OXIDE Krasil'nikova, M. K.; Lygin, V. I.; Topehieva, K. V. (Moscow State Univ.). Teor. Eksp. Khim., 11: 255-9 (Mar.-Apr. 1966). (In Russian).

The adsorption of ethylene and hydrogen on yttrium oxide specimens subjected to heat treatment at 500 and at 800°C in a vacuum was investigated to determine the chemical compounds formed at the surface. Transmission of the specimens at 3000 cm^{-1} ranged from 25 to 30%; at 1200 cm^{-1} it was 45 to 50%. It was found that chemisorption of ethylene yields an unsaturated compound, with a C=C double bond appearing after the start of the experiment. Carbonization of the specimen, yielding hydrogen and ethane, made it possible to obtain its spectrum. The specimens at 500 and 800°C contained 0.2 and 0.02% of water, respectively. Tests with the rehydrated oxide indicated that the surface OH group prevents the formation of the unsaturated compound. Adsorption of hydrogen resulted in an increased infrared absorption. The hydrogen, being an electron donor, or n-type semiconductor, causes a sudden increase in the electrical conductivity of Y_2O_3. It is possible that the hydrogen is adsorbed in the proton form. All of the hydrogen is removed by pumping out the system at 700°C. (TTT)

35522 PHASE TRANSFORMATION, OXIDATION, AND HYDRATION OF PRASEODYMIUM SESQUIOXIDE. Sastry, R. L. N. (Indian Inst. of Science, Bangalore, India); Mehrotra, P. N.; Rao, C. N. R. Trans. Faraday Soc., 62: 1632-7(June 1966).

The C → A transformation of Pr_2O_3 was examined. The transformation is sluggish and takes place at and above 750°C. C-Pr_2O_3 is oxidized at a lower temperature than the A-form and oxidation proceeds in two stages in both cases. A hydrate $Pr_2O_3 \cdot H_2O$, formed by the interaction of C-Pr_2O_3 and water at relatively high temperature, is described and its behavior compared with that of $Pr(OH)_3$. The C-form undergoes hydration at 40°C while the A-form does not. All the observations are explained in terms of the defect structure of C-Pr_2O_3. (auth)

35523 KINETICS OF THE ZIRCONIUM–CARBON REACTION AT TEMPERATURES ABOVE 2000 DEG C. Adelsberg, L. M.; Cadoff, L. H.; Tobin, J. M. (Westinghouse Electric Corp., Pittsburgh). Trans. Met. Soc. AIME, 236: 972-7(July 1966).

The reaction between liquid zirconium and graphite at temperatures above 2000°C was investigated. The reaction products were found to be carbon-saturated zirconium metal and ZrC, which formed between the graphite and the metal. Parabolic growth behavior was observed for the ZrC phase at all temperatures of this investigation. The parabolic growth constant at temperatures between 2000 and 2860°C was measured to be 1.83 exp (–84,300/RT) cm^2 per sec. The reaction mechanism was proposed to be the rapid carbon saturation of the liquid metal and the formation of ZrC at the metal-carbide interface with diffusion of carbon through the ZrC, the "rate-determining step" of the reaction. The concentration-independent diffusion coefficient of carbon in ZrC, (D_C^{ZrC}), was expressed as 0.95 exp (–78,700/RT) cm^2 per sec. This value was calculated using the temperature-invariant ZrC phase fields proposed in the literature. The [Zr(liq)] – [Zr(liq) + ZrC] phase boundary over the temperature range from 2000 to 2800°C was determined and the ZrC + C eutectic temperature was found to be 2890 ± 50°C. (auth)

35524 THERMODYNAMICS OF THE CERIUM–HYDROGEN SYSTEM. Lundin, C. E. (Univ. of Denver). Trans. Met. Soc. AIME, 236: 978-81(July 1966).

The Ce–H system was investigated in the temperature range from 573 to 1023°K and the pressure range from 10^{-3} to 630 torr, as a function of composition up to 72 at. % H. Families of isothermal and isopleth curves were plotted from the pressure-temperature-composition relationships. From these curves the solubility relationships were determined for the system. The isopleths are analytically represented by equilibrium dissociation pressure equations. The relative partial molal enthalpies and entropies of solution of hydrogen in the system were calculated from the dissociation pressure equations and are tabulated. The integral free energies, enthalpies, and entropies of mixing in the Ce–H system were determined from the relative partial quantities and are also tabulated. The standard free energy, enthalpy, and entropy of reaction of the dihydride phase at 923°K are: $\Delta F^0 = -16.8$ kcal per mole H_2, $\Delta H^0 = -48.3$ kcal per mole H_2, and $\Delta S^0 = -34.1$ cal per deg mole H_2, respectively. The equilibrium dissociation pressure equation in the two-phase region is: $\log_{10}p(\text{torr}) = -(10{,}920 \pm 50/T) + 10.81 \pm 0.06$. (auth)

35525 ON THE NATURE OF THE THERMOEMISSIVE PROPERTIES OF BORIDES OF RARE-EARTH ELEMENTS. Samsonov, G. V.; Shlyuko, V. Y. (Inst. of Problems in Material Studies, Kiev). Ukr. Fiz. Zh., 11: 437-8(Apr. 1966). (In Ukrainian).

The nature of the work function of the rare earth hexaborides can be interpreted by orbital theory. The three most stable configurations are the f^0, f^7, and f^{14} configurations. The work functions of the rare earth metals increase regularly with increasing number of electrons in the f-shell up to f = 6 (including samarium), that is, the work function increases with increasing statistical weight of the stable f^7-configuration in the metal. The work function of europium is lower than that of samarium, because its s-electrons take part freely in the thermoemission and are not required to form a stable f-shell. In gadolinium there is a stabilized d-electron which leads to an increase in the work function of Gd compared to Eu. With more than seven f-electrons the work function increases slowly. The behavior of Yb and Lu is similar to that of Eu and Gd. Since the rare earth metal can form sp^3 orbitals with boron in the hexaborides, in most cases the work functions of the rare earth borides are higher than the corresponding work functions of the rare earth metals. However, the work functions of LaB_6, GdB_6, and LuB_6 are lower than those of La, Gd, and Lu because of the presence of an electron in the d-shell. (TTT)

35526 SIMPLE METHOD FOR DETERMINATION OF THE D_2O CONCENTRATION. Cabicar, J.; Einhorn, F. (Technische Hochschule, Prague). Z. Naturforsch., 21a: 504(Apr. 1966). (In German).

The displacement of the absorption spectrum as an indication of the D_2O concentration was investigated. It was shown that in saturated $CuSO_4$ solutions of various D_2O concentrations the spectral displacement or the height of the differential curves is a linear function of the D_2O concentration. By use of a colorimeter, in connection with a suitable filter, determinations could be made of D_2O concentrations with an accuracy of over 0.5 %. (J.S.R.)

35527 CHEMICAL ANALYSIS OF THE PHASE COMPOSITIONS IN THE MgO–Cr_2O_3–ZrO_2 SYSTEM. Klyucharov, Ya. V.; Kral', O. A. Zh. Prikl. Khim., 39: 220-3 (Jan. 1966). (In Russian).

The method developed for chemical analysis of phases in the ternary system MgO–Cr_2O_3–ZrO_2 made it possible to establish completely the phase composition of the products of annealing and also the amount of magnesium oxide dissolved in ZrO_2 as a result of solid-state reactions occurring in the presence of the reaction products of magnesium oxide and chromium. The method is useful for phase analysis of compositions containing small quantities of one of the materials. The method can be used for the determination of the phase composition of complex mixtures in which, together with zirconium dioxide and its solid solutions, minerals are contained that are not soluble in hydrofluoric and oxalic acids. (tr-auth)

Organic Chemistry

Refer also to abstract 35542.

35528 (ORNL-TM-1572) SYNTHESES OF THREE QUATERNARY PHOSPHONIUM HALIDES. Holsopple,

H. L. (Oak Ridge National Lab., Tenn.). July 12, 1966. Contract W-7405-eng-26. 11p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The syntheses of three quaternary phosphonium compounds: tri-n-butylbenzylphosphonium bromide, tri-octylbenzylphosphonium bromide, and tetra-n-butylphosphonium iodide, are described. These compounds were prepared by reacting the appropriate tertiary phosphine with the required alkyl halide. Elemental analyses were in good agreement with calculated values. The NMR and infrared spectra of these compounds are presented. (auth)

35529 EFFECT OF SUBSTITUENTS ON THE RATE OF ISOTOPIC HYDROGEN EXCHANGE IN FERROCENE DERIVATIVES. Nefedova, M. N.; Kursanov, D. N.; Setkina, V. N.; Perevalova, E. G.; Nesmeyanov, A. N. Dokl. Akad. Nauk SSSR, 166: 374-7(Jan. 11, 1966). (In Russian).

The rate constants for acid isotopic exchange of hydrogen in six monosubstituted and four disubstituted ferrocenes were determined. The relative rate constants K_{rel} were then calculated assuming unity for unsubstituted ferrocene. The substituents studied included both electro-donor and electron-accepter types. An analysis of the resultant data shows that the effect of the substituent on the reaction rate in an aromatic compound may be described as a combination of induction and conjugation. The conjugation effect is much less important in this case than it is in electrophilic substitution in the benzene series. It was found that the substituent constants obtained from the dissociation constants for phenylacetic acids may be used as a quantitative index of the effect which the substituent has on the reaction rate. Curves for $\ln k/k_0$ for all substituents studied show a linear correlation with these constants. Heterocyclic disubstituted derivatives lie on this same line if doubled values of substituent constants are used, i.e., the substituents have an additive effect within the limits of experimental error. (JPRS)

35530 ELECTRON SPIN RESONANCE OF IRRADIATED SINGLE CRYSTALS OF ALLOXAN MONOHYDRATE. Kashiwagi, Michio (Toyo Rayon Co., Kamakura, Japan). J. Mol. Spectros., 20: 190-2(June 1966).

The hydroxyl hydrogen coupling found in x-irradiated single crystals of alloxan monohydrate is reported. ESR spectra of the irradiated single crystals were measured at 9.5 kMc/sec. The spectrum consists of two strong inner lines and two weak satellite lines. The ESR spectra of the radicals derived from alloxan monohydrate show mainly the two lines with a hydroxyl hydrogen coupling. The satellite lines are due to forbidden transitions which arise from the hydroxyl hydrogen coupling constant A^H of strong anisotropy combined with the comparable magnitude of the Zeeman interaction of the hydroxyl proton. The ^{13}C coupling structure was also measured. Results of calculations are tabulated. (P.C.H.)

35531 ULTRA-VIOLET ABSORPTION SPECTRUM OF THYMINE IN ICE. Davis, Stephen L.; Tinoco, Ignacio Jr. (Univ. of California, Berkeley). Nature, 210: 1286 (June 18, 1966).

Aggregations of molecules of various frozen solutions were studied by uv absorption spectra. The change in absorption was quite pronounced. Although other solutions all gave broadened spectra in the frozen solutions, none showed the striking differences found in thymine. The thymine spectrum in ice at 77°K was essentially identical to that for dry sublimed thymine at the same temperature. This is strong evidence that aggregates of thymine molecules occur in the ice similar to those present in the sublimed film. Alcohol partially restored the liquid-solution spectra and strengthened the conclusion that the frozen-solution spectrum indicated interaction between thymine molecules. (P.C.S.)

35532 POLYMERIZATION OF CRYSTALLINE TRIOXANE. III. EXPERIMENTS WITH IRRADIATED TRIOXANE SINGLE CRYSTALS. Van der Heijde, H. B.; Van Kasteren, P. H. G. (Shell Research NV, Amsterdam). Phil. Mag., 13: 1039-53(May 1966).

Irradiation with x-rays imparts to trioxane crystals a perennial capacity for later polymerization to high conversion. This capacity remains latent at room temperature, but becomes manifest above a threshold temperature varying with the history of the crystal (40-55°C). Yet, even at room temperature, intensive reorganization of the crystals takes place within two hours of the irradiation, the radiolysis products being segregated into cavities and cracks in the lattice, and in part exuded to the outer surface (Stage 1). Polymer crystal nucleation, leading to the formation of a white, reflecting haze, also occurs at room temperature, though at a slower rate, or somewhat later (Stage 2). In view of the spontaneous polymerization observed to occur at dry trioxane surfaces (van der Heijde et al., 1965), it is concluded that this is what the irradiation does to promote later polymerization: creating dry surface within the monomer crystal. The topokinetics of the polymerization above the threshold temperature lead to the conclusion that this reaction proceeds in at least two more stages (3 and 4). Stage 3 involves the growth of a tenuous structure of primary ribbons sprouting from the nuclei-carrying defect surfaces into the monomer crystal. Stage 4 consists of the multiplication of these primary ribbons by fast collateral development of secondary ribbons, and leads to a densening of the pseudomorph. This conclusion is supported by the micro- and macro-morphology of the product in its various stages of development. The twins, which Carazzolo et al. (1963) proved to exist in the polymer by x-ray diffraction—"Z"-crystals || the monomer c-axis, and "W"-crystals in three equivalent orientations at 76° to the c-axis—cannot be traced in the morphology of the product, as the ribbons are invariably extended along the c-axis. The crystal optics of incipient ribbon aggregates do reveal the existence of the W-orientations, but only in the region where growth of these aggregates started. A tentative explanation for this phenomenon is offered. (auth)

35533 POLYMERIZATION OF CRYSTALLINE TRIOXANE. II. EXPERIMENTS WITH IRRADIATED TRIOXANE (AND TETRAOXANE) CALCULATION OF THE CRYSTAL FIELD OF TRIOXANE. Nauta, H. (Shell Research NV, Amsterdam). Phil. Mag., 13: 1023-37(May 1966).

The physics of the polymerization of irradiated trioxane crystals was studied experimentally and theoretically. A geometrical comparison of the monomer and polymer crystal lattices suggests that growth of the polymer twins must occur in a synchronized fashion. The crystal field in the polar trioxane lattice was calculated. The results are highly suggestive of its important role in the polymerization. Experiments with tritiated water show that this contaminant resides specifically on the crystal surface. Trioxane was found to have no phase transitions between room temperature and the melting point. The heat of the polymerization is 21 cal g^{-1}. Partly polymerized trioxane shows a melting behavior, suggesting the occurrence of trioxane in two different phases. Tetraoxane can be polymerized in a similar way as trioxane. The heat of the reaction is 23 cal g^{-1}. (auth)

35534 DIE SYNTHESE KOHLENSTOFF-14-MARKIERTER ORGANISCHER VERBINDUNGEN. (Synthesis of ^{14}C Labeled Organic Compounds). Bubner, Marianne; Schmidt, Lothar. Leipzig, VEB Georg Thieme, 1966. 190p.

The methods for preparation of ^{14}C-labeled compounds by chemical synthesis, purification of the compounds, and storage of labeled compounds are compiled on the basis of a literature search and laboratory studies. The hypotheses used in work with radioactively labeled organic compounds are summarized and considerations necessary for planning of experiments with these compounds are reported. The laboratory equipment and analyses used in the chemical synthesis of labeled organic compounds are described. The synthetic methods used in the preparation of specific compounds from ^{14}C-$BaCO_3$, carboxylic acids, ^{14}C-alkyl halides, halogen carboxylic acid, ^{14}C-potassium cyanide, and ^{14}C-aromatic compounds are given in some detail. (J.S.R.)

Radiation Chemistry

See also **BIOLOGY AND MEDICINE — Radiation Effects on Biochemicals Radiation Effects on Tissues**

35535 (AD-634859) THE CHEMICAL EFFECTS OF IRRADIATED TRIPLE-BOND COMPOUNDS. Rondeau, Roger E.; Harrah, Larry A. (Air Force Materials Lab., Wright-Patterson AFB, Ohio). Apr. 1966. 54p. (AFML-TR-66-33). CFSTI $3.00 cy, $0.50 mn.

The radiation chemistry of acetonitrile, propionitrile, and fifteen alkynes was studied using product analysis (PA), electron spin resonance spectrometry (ESR), and mass spectrometry (MS). The results of each study are discussed in terms of reactions proceeding through energetic intermediates. The ESR and MS studies are concerned with the intermediates responsible for the product distribution found in the PA study. Topics of discussion include phase effects, extent of H_2 evolution, toxic product yields, cyclization reactions, induced polymerization, and radiation protection. (auth)

35536 (MLM-1299) MOUND LABORATORY PROGRESS REPORT FOR SEPTEMBER 1965. Eichelberger, J. F.; Grove, G. R.; Jones, L. V. (Mound Lab., Miamisburg, Ohio). Sept. 21, 1965. Contract AT(33-1)-Gen-53. 31p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Research progress is reported in three sections. A separate abstract was prepared for each section. (J.R.D.)

For abstracts of individual sections see: 35537, 35570, and 35827.

35537 (MLM-1299, pp 7-16) RADIOELEMENTS. (Mound Lab., Miamisburg, Ohio).

In preliminary work the hydrolysis of uranyl ions is being determined as a substitute for Pu. Previous results indicated that uranyl ions hydrolyze to form dimers. The results obtained by increasing the concentration range of the uranyl nitrate solutions indicated that the (2.2) complex was the predominant species, but that additional hydrolytic species are present. The data indicated that hydrolysis was concentration dependent. The angular relationships of three gamma rays closely spaced in energy occurring in the electron capture of ^{208}Po are being determined. This triplet (534, 565 and 599 kev) is emitted subsequent to emission of a 291 kev gamma ray in the decay. Data were collected for six different angles, and will be reduced by computer operations to angular correlation information. A ^{209}Bi target was bombarded with 21 mev deuterons to provide an additional mixture of Po isotopes. Approximately 0.1 millicurie of ^{208}Po and ^{209}Po was produced. Results of alpha and gamma ray study of this mixture will be correlated with results of other mixtures to improve energy level assignments of the two isotopes. (auth)

35538 LUBRICATING GREASES RESISTANT TO RADIATION AND TEMPERATURE. Bedague, P. Bull. Inform. Sci. Tech. (Paris), No. 105, 39-55(June 1966). (In French).

Among the different thickeners used in the manufacture of high-temperature lubricating greases, vat dyes and aromatic ureas were chosen to prepare radiostable greases. Such greases, which can lubricate mechanisms in nuclear reactors, stable up to a dose of 10^9 rads, were prepared, adding to a base oil of the polyphenyl ether class, either an anthraquinone or an imide dye and ureas derived from diphenyl ether. (auth)

35539 STUDY OF THE RADIATION CHEMISTRY OF AMMONIA, ESPECIALLY WITH RESPECT TO THE FORMATION OF HYDRAZINE. Gaussens, Gilbert (CEN, Gif-sur-Yvette, France). Compt. Rend., Ser. C, 262: 1613-16(June 13, 1966). (In French).

The radiation chemistry of pure ammonia or ammonia mixed with different interceptors and their various mixtures was studied with γ rays of ^{60}Co. The formation kinetics of radiolysis products were determined. The effects of the dose, dose output, and temperature are defined. (tr-auth)

35540 MALONIC ALDEHYDE IS PRODUCED BY γ IRRADIATION OF GALACTOSE AT pH 9.5. MODIFICATION OF THE PHENOMENON BY SODIUM BORATE (PROTECTION EFFECT BY FORMATION OF COMPLEXES). Morre, Jean; Morazzani-Pelletier, Simonne (Laboratoire de Radiobiologie du Service Veterinaire de la Seine, Paris. Faculte des Sciences, Paris). Compt. Rend., Ser. C, 262: 1729-31(June 13, 1966). (In French).

By application of the Job method, the borate–sugar complex was identified by irradiation with ^{60}Co. It was found that the production of malonic aldehyde was a decreasing function of the borate concentration. (tr-auth)

35541 THE MECHANISM GOVERNING THE EFFECT OF PRELIMINARY IRRADIATION ON THE THERMAL DECOMPOSITION OF ALKALI METAL PERMANGANATES. Boldyrev, V. V.; Oblivantsev, A. N.; Raitsimling, A. M.; Uskov, E. M. (Inst. of Chemical Kinetics and Combustion, Academy of Sciences, Siberian SSR). Dokl. Akad. Nauk SSSR , 166: 891-3(Feb. 1, 1966). (In Russian).

It is an accepted hypothesis that the acceleration in the thermal decomposition of irradiated permanganates is caused by radiochemical processes which form radiolysis products. The present study was carried out in order to find out which of these products can act as catalysts and how the mechanism of this process can be interpreted. It is shown that factors which increase the concentration of free electrons or MnO_4^{2-} ions in the permanganate lattice cause a decrease in the rate of thermal decomposition (e.g., the introduction of manganate ion into potassium and cesium permanganate crystals by cocrystallization from aqueous solutions). The solid radiolysis product catalyzing the thermal decomposition of irradiated permanganates is thought to be MnO_2 and the acceleration effect results from the combination of the following factors acting in two opposite directions: the accelerating effect of MnO_2 and inhibiting effect of MnO_4^{2-}, both of which are formed during the radiolysis of permanganates. (ATD)

35542 STUDY OF THE PROCESS OF GRAFT POLYMERIZATION OF ACRYLONITRILE ON CAPRON FIBERS. Kurilenko, A. I.; Glukhov, V. I. Dokl. Akad. Nauk SSSR, 166: 901-4(Feb. 1, 1966). (In Russian).

The effects of caprone fiber permeability on the kinetics of graft polymerization of acrylonitrile carried out from the gas phase by the post-effect method was investigated. Experimental data on these kinetics, the disappearance of free radicals associated with this process, the sorption of acrylonitrile by ^{60}Co-irradiated caprone fibers at 20–90°C are reported. The polymerization rate was found to be determined by diffusion of the monomer, but it is independent of the fiber diameter and is proportional to the equilibrium concentration of the sorbed acrylonitrile. The ESR signal did not change in the course of the disappearance of free radicals; apparently, the radicals of caprone initiate the graft polymerization of acrylonitrile, and the lifetime of the growing chains is such that they do not accumulate in any appreciable quantities. A mechanism accounting for the results of the kinetic measurements is proposed. (P.C.H.)

35543 WATER-SOLUBLE PRODUCTS OF UV-IRRADIATED, AUTOXIDIZED LINOLEIC AND LINOLENIC ACIDS. Baker, Nome; Wilson, Leon (Veterans Administration Center, Los Angeles). J. Lipid Res., 7: 341-8 (May 1966).

The water-soluble products of the uv-initiated autooxidation of linoleic and linolenic acids emulsified in water were separated into volatile and relatively involatile components, each of which reacted with both thiobarbituric acid (TBA) and peroxidase. The volatile TBA-reactive compound is probably malonaldehyde and the volatile peroxidase-reactive compound is hydrogen peroxide. Additional compounds which absorb uv light were present in the volatile fraction. After thin-layer chromatography of the involatile fraction, reactivity toward TBA and peroxidase was found in the same spot. Approximate molar yields of hydrogen peroxide, malonaldehyde, hydroperoxides, and other TBA-reactive

compounds were estimated. The ratio of hydroperoxide to TBA reactivity was lower for linoleic than for linolenic acid. The mass of relatively involatile compounds was about 20 times greater than that predicted from either peroxidase or TBA assays of water extracts of oxidized linolenic acid. (TCO)

35544 ANNEALING OF CHEMICAL RADIATION DAMAGE IN POTASSIUM BROMATE. Khare, M.; Mohanty, S. R. (Banaras Hindu Univ., India). J. Inorg. Nucl. Chem., 28: 1527-34(Aug. 1966).

Kinetics of annealing of γ radiation damage in potassium bromate was studied. Annealing can be represented by models developed for interstitial vacancy recombination, and by the combination of a unimolecular and a bimolecular process. The unimolecular process seems to correspond to the recombination of close BrO_2^- and O fragments, and the bimolecular process to the random reaction $BrO_2^- + O_2 \rightarrow BrO_3^- + O$ followed by the rapid reaction $BrO^- + O \rightarrow Br^- + O_2$. (auth)

35545 CHEMICAL STATES OF ^{35}S IN NEUTRON-IRRADIATED AMMONIUM CHLORIDE. Cifka, J.; Kliment, V. (Nuclear Research Inst., Czechoslovak Academy of Sciences, Rez). J. Inorg. Nucl. Chem., 28: 1535-41 (Aug. 1966).

Preparation of the target material influenced the distribution of ^{35}S atoms between the respective valency states. Substantial ^{35}S activity was found in the sulfide fraction. Oxidation of ^{35}S occurred during thermal annealing; a short initial reduction period was observed for some samples. Increasing temperature and duration of the neutron irradiation caused a decrease in ^{35}S activity in the sulfide fraction. (auth)

35546 RADIOCHEMICAL PROCESSES IN IRIDIUM COMPLEXES. III. PRODUCTS FROM (n,γ) PROCESS IN POTASSIUM CHLOROIRIDATE. Cabral, J. M. Peixoto (Junta de Energia Nuclear, Sacavem, Portugal). J. Inorg. Nucl. Chem., 28: 1543-51(Aug. 1966).

Products found soon after solution of neutron-irradiated potassium chloroiridate crystals comprised some of the species found for the hexahydrated sodium salt. However, the quantitative distribution was very different. By examining solutions of the former salt in 0.01N HCl and 0.01N NaCl evidence for a reversible dissociation of the main product, $IrCl_4(H_2O)_2 \rightleftharpoons IrCl_4(OH)_2^{2-} + 2H_{aq}^+$, was obtained that another of the fractions, previously identified as $IrCl_6^{2-}$, really comprises two species. Anhydrous potassium salt gave a larger proportion of Ir(IV) products and less reduction and aquation took place than with the hydrated sodium salt. (auth)

35547 RADIOLYTIC FORMATION OF TETRAVALENT BROMINE AND ITS REACTIONS WITH HALIDE IONS AND HALOGENS. Anbar, M.; Neta, P. (Weizmann Inst. of Science, Rehovoth, Israel. Soreq Nuclear Research Centre, Rehovoth, Israel). J. Inorg. Nucl. Chem., 28: 1645-9(Aug. 1966).

Formation of tetravalent bromine as a result of the reduction of bromate ions by radiolytically produced hydrated electrons and hydrogen atoms was investigated in the iodide–bromate system. BrO_3^{2-} (or BrO_2) may react both as an oxidant or as a reductant. BrO_3^{2-} was found to oxidize iodide and bromide in an acid catalyzed reaction. The reactions of BrO_3^{2-} with I_2 and Br_2 to give $BrO_3^- + I_2^-$ and Br_2^- demonstrate the reducing properties of tetravalent bromine. (auth)

35548 PULSE RADIOLYSIS OF DEAERATED AQUEOUS BROMIDE SOLUTIONS. Matheson, M. S.; Mulac, W. A.; Weeks, J. L.; Rabani, J. (Argonne National Lab., Ill.). J. Phys. Chem., 70: 2092-9(July 1966).

The pulse radiolysis of deaerated aqueous KBr solutions in the pH range from 5 to 9 yielded $k(OH + Br^-) = (1.2 \pm 0.15) \times 10^9\ M^{-1}\ sec^{-1}$, $2k(Br_2^- + Br_2^-) = (3.3 \pm 1.0) \times 10^9\ M^{-1}\ sec^{-1}$, and $k(e_{aq}^- + Br_2^-) = (1.3 \pm 0.5) \times 10^{10}\ M^{-1}\ sec^{-1}$. The value of $k(OH + Br^-)$ increased at low pH values and decreased markedly at high pH, indicating that the transition complex $BrOH^-$ may react with H_3O^+. The molar extinction coefficient of Br_2^- at 3650 Å is $7800 \pm 2000\ M^{-1}\ cm^{-1}$. The $k(OH + Br^-)$ value was compared with other rate constants for OH by means of rate constant ratios in the literature. Relative rate constants involving $k(OH + Br^-)$ must be used cautiously because of the pH sensitivity of this rate constant. (auth)

35549 THE PULSE RADIOLYSIS OF DEAERATED AQUEOUS CARBONATE SOLUTIONS. I. TRANSIENT OPTICAL SPECTRUM AND MECHANISM. II. pK FOR OH RADICALS. Weeks, James L.; Rabani, Joseph (Argonne National Lab., Ill.). J. Phys. Chem., 70: 2100-6(July 1966).

The pulse radiolysis of deaerated aqueous carbonate solutions in the neutral and alkaline pH was studied. A mechanism is presented, and several rate constants were determined (all are in units of $M^{-1}\ sec^{-1}$): $k(OH + CO_3^{2-}) = 4.2 \times 10^8$, $k(O^- + CO_3^{2-}) < 10^7$, $2k(CO_3^- + CO_3^-) = 1.25 \times 10^7$ (zero ionic strength), and $k(OH + HCO_3^-) = 1.5 \times 10^7$. In the pulse radiolysis of carbonate solutions a transient optical absorption appears, which is identified as the carbonate radical ion (CO_3^-). Its spectrum is reported and has a maximum extinction coefficient of $1860 \pm 160\ M^{-1}\ cm^{-1}$ at 6000 A. There is a pH dependency of the rate of CO_3^- formation, from which the pK for the ionic dissociation of OH radicals was determined as 11.8 ± 0.2, where pK is defined as $-\log\{[H^+]\ [O^-]/[OH]\}$. The results are compared with earlier work. (auth)

35550 A STUDY OF SOME FREE-RADICAL REACTIONS IN AQUEOUS γ RADIOLYSIS BY DIRECT MEASUREMENTS OF Cu^+ INTERMEDIATES DURING IRRADIATION. Micic, Olga; Draganic, Ivan (Boric Kidric Inst. of Nuclear Sciences, Vinca, Yugoslavia). J. Phys. Chem., 70: 2212-19(July 1966).

Changes in potential and limiting currents on a rotating platinum electrode were studied directly and continuously during irradiation of aqueous solutions of cupric sulfate and sulfuric acid, with and without ethanol. Conditions under which Cu^+ intermediates may be directly measured are demonstrated. Measurements were made at pH values ranging from 1.5 to 4.5 and for different scavenger concentrations. Dependent on the experimental conditions, the limiting current was a measure of the primary reducing short-lived species or of the total free-radical yield. It made possible calculation of the primary radical product yields in water radiolysis in the pH region studied, $G_H + G_{e_{aq}^-}$ and G_{OH}. By measuring competition reactions it was found that $k_{H,Cu^{2+}}/k_{H,C_2H_5OH} = 2.64 \pm 0.06$ and $k_{e_{aq}^-,Cu^{2+}}/k_{e_{aq}^-,H^+} = 1.64 \pm 0.03$. From these measurements it was also derived that at pH 3.6 – 4.8, $G_{e_{aq}^-} = 2.3 \pm 0.1$. Variation of the sulfate ion concentration in the solutions studied confirmed that dissociated as well as undissociated forms of copper act as efficient scavengers. (auth)

35551 ELECTRON SPIN RESONANCE STUDIES OF FUNDAMENTAL PROCESSES IN RADIATION AND PHOTOCHEMISTRY. II. PHOTOCHEMICAL REACTIONS IN γ-IRRADIATED NITRILES AT 77 DEG K. Ayscough, P. B.; Collins, R. G.; Kemp, T. J. (Univ., Leeds, Eng.). J. Phys. Chem., 70: 2220-3(July 1966).

The γ radiolysis of acetonitrile at 77°K in the absence of light results in the formation of trapped CH_2CN radicals together with a highly photosensitive species, which yields methyl radicals when irradiated with infrared or red light. Irradiation with white light results in the disappearance of methyl radicals and the formation of further CH_2CN radicals. These reactions are interpreted in terms of a mechanism involving both trapped electrons and positive "holes." The comparative behavior of propionitrile and malononitrile is also discussed briefly. (auth)

35552 HYDROGEN IODIDE AS A RADICAL SCAVENGER IN THE RADIOLYSIS OF HYDROCARBONS. Perner, D.; Schuler, Robert H. (Mellon Inst., Pittsburgh). J. Phys. Chem., 70: 2224-32(July 1966). (RRL-2310-168).

Hydrogen iodide was used as a scavenger to measure the total radical yield in the radiolysis of saturated alkanes. Initially, the radicals react with hydrogen iodide to produce iodine. As iodine builds up, competitive scavenging occurs

between the two solutes present. It was found possible to treat the competition kinetics analytically and correct the iodine production curves for the reaction with iodine so as to obtain an accurate value for the initial yield. This yield was found to be equal to that of iodine disappearance in the corresponding iodine-alkane system. The ratio for the rate constants for the two scavenging reactions can be obtained from a detailed consideration of the growth and decay of iodine as the irradiation progresses. The value for the ratio k_{R+I_2}/k_{R+HI} was found to be 2.0 in hexane at room temperature. (auth)

35553 SCAVENGER KINETICS IN THE RADIOLYSIS OF CYCLOHEXANE SOLUTIONS. I. PURE CYCLOHEXANE. Mani, Inder; Hanrahan, Robert J. (Univ. of Florida, Gainesville). J. Phys. Chem., 70: 2233-40 (July 1966).

Competitive reactions of HI and I_2 with free radicals in γ-irradiated liquid cyclohexane were studied. The experimental data consist of graphs of iodine concentration vs. dose in experiments in which I_2, HI, or both are added to pure degassed cyclohexane before radiolysis. Rate equations, based on previously proposed mechanisms, were set up and their integration was done by numerical calculations using the second-order Runge-Kutta method on an IBM 709 computer. The theoretical curves obtained fit the experimental curves well. A value for the ratio k_{HI}/k_{I_2} for competitive scavenging of alkyl radicals by HI and I_2 in cyclohexane was obtained. (auth)

35554 RADIATION-INDUCED ISOMERIZATION OF STILBENE IN BENZENE AND CYCLOHEXANE. Hentz, Robert R.; Peterson, D. B.; Srivastava, S. B.; Barzynski, Helmut F.; Burton, Milton (Univ. of Notre Dame, Ind.). J. Phys. Chem., 70: 2362-72(July 1966).

The γ-induced isomerizations of cis- and trans-stilbene were studied in cyclohexane, benzene, and the mixed solvents. In cyclohexane at low stilbene concentrations (<0.01 M), the ratio $G_{c\rightarrow t}/G_{t\rightarrow c}$ approximates the corresponding quantum yield ratio (~0.85) obtained in photochemical studies. With an increase in stilbene concentration beyond 0.01 M, $G_{c\rightarrow t}$ continues to increase as $G_{t\rightarrow c}$ approaches a limiting value of ~1.4. In benzene solutions, the ratio $G_{c\rightarrow t}/G_{t\rightarrow c}$ approximates the quantum yield ratio up to 0.1 M stilbene, beyond which concentration $G_{t\rightarrow c}$ approaches a limiting value of ~2.9 as $G_{c\rightarrow t}$ continues to increase. Effects of various additives were examined. In the mixed solvent systems, the isomerization yield of 10^{-2} M trans-stilbene increases with benzene concentration in a manner related to suppression of $G(H_2)$ by benzene in cyclohexane–benzene mixtures. A proposed mechanism of isomerization suggests that the isomerization of cis-stilbene at low concentrations and of trans-stilbene at all concentrations occurs via triplet states of stilbene. At higher cis-stilbene concentrations, direct ionic chain isomerization occurs by charge transfer between "free" stilbene ions and stilbene molecules. At low stilbene concentrations (<0.05 M) in benzene, isomerization proceeds largely via transfer from benzene triplet states. At higher stilbene concentrations in benzene (as always in cyclohexane), the triplet state of stilbene is formed directly by neutralization of stilbene ions. According to the proposed mechanism, in cyclohexane, G(ion pairs) ≈ 2.6 and the ionic chain length is 14 at 0.2 M cis-stilbene. In benzene, G(triplets) = 5.4 and the ionic chain length is 31 at 1.8 M cis-stilbene. The ratio $k(e^- + \text{stilbene})/k(e^- + \text{benzene}) = 70$. The decay time of triplet benzene produced by high-energy irradiation of the pure liquid is $<10^{-8}$ sec. (auth)

35555 OBSERVATIONS ON TRAPPED ELECTRONS AND ALLYL RADICALS FORMED IN 2-METHYLPENTENE-1 BY γ RADIOLYSIS AT LOW TEMPERATURE. Smith, D. R.; Pieroni, J. J. (Atomic Energy of Canada, Chalk River, Ont.). J. Phys. Chem., 70: 2379-83(July 1966).

The ^{60}Co γ radiolysis of 2-methylpentene-1 (2-MP-1) glass at 77°K was studied by electron spin resonance (ESR) methods. The ESR spectra due to trapped electrons and an allyl-type radical were observed. When biphenyl was present, the ESR spectrum of the biphenyl anion replaced that of trapped electrons. The results suggested that the allylic radical is formed via isomerization of the parent ion $(2\text{-MP-}1)^+ \rightarrow (2\text{-MP-}2)^+$. An ultraviolet photoinduced conversion of the allylic radical to a different allylic radical was observed at 77°K. No free radicals resulting from hydrogen atom addition to olefin were detected. (auth)

35556 ISOMERIC-TRANSITION-INDUCED REACTIONS OF ^{130}I IN CYCLOHEXANE. Merrigan, J. A.; Nicholas, J. B.; Lambrecht, R. M.; Parks, N. J.; Rack, E. P. (Univ. of Nebraska, Lincoln). J. Phys. Chem., 70: 2417-18 (July 1966). (COO-1617-1).

Using the freeze-thaw technique organic yields due to $^{130}I^m(I.T.)^{130}I$ processes in liquid cyclohexane within ±0.8% were obtained. The organic yield of ^{130}I following neutron irradiation and decay of $^{130}I^m$ in the solid state was 2.8% in the 7.8×10 mole fraction $^{129}I_2$ system. This low yield was attributed to phase separation between iodine and cyclohexane on freezing. When an identical sample was melted 20 sec after a 30-sec solid-state irradiation and $^{130}I^m$ allowed to decay in the liquid system, the yield was 21.7%. A table comparing the organic yields of ^{130}I due to $^{130}I^m(I.T.)^{130}I$ processes and those of ^{128}I produced by the $^{127}I(n,\gamma)^{128}I$ process with those due to $^{82}Br^m(I.T.)^{82}Br$ and $^{79}Br(n,\gamma)^{80}Br^m$ is given. (D.H.M.)

35557 RADIOLYSIS OF PURE DECABORANE-14. Klingen, T. J.; O'Neal, J. M. (Univ. of Mississippi, University). J. Phys. Chem., 70: 2421-2(July 1966).

The products of the ^{60}Co γ radiolysis of pure decaborane-14 in the solid state were found to be hydrogen, diborane, pentaborane-9, and a polymeric substance. Results of the yields of the gaseous products at 35°C as a function of total dose, and as a function of temperature at total doses are given. (D.H.M.)

35558 INVESTIGATIONS IN THE FIELD OF THE RADIATION-INDUCED SOLID STATE POLYMERIZATION. XV. THE COPOLYMERIZATION OF VINYL CHLOROACETATE AND VINYL LAURATE. Hardy, Gyula; Boros-Gyevi, Janosne. Magyar Kem. Foly., 72: 116-18(Mar. 1966). (In Hungarian).

The γ-radioinduced liquid phase copolymerization of vinyl chloroacetate and vinyl laurate is characterized by the values $r_1 = 0.87$ and $r_2 = 0.65$. The possibility of copolymerization in the solid state is determined by the physical structure of the solid binary system. The rate of the copolymerization in the supercooled liquid phase is twice as high as in the solid state under similar conditions. (auth)

35559 CHEMICAL EFFECT OF ELASTIC NUCLEAR IMPACT: IRRADIATION OF POLYETHYLENE TEREPHTHALATE WITH SLOW PROTONS. Jung, Horst (Kernforschungszentrum, Karlsruhe, Ger.). Makromol. Chem., 93: 243-54(1966). (In German).

The slower the particle the greater is the effective cross-section for elastic interaction of heavy particles with atomic nuclei. On this basis the effects of slow protons with energies between one and 12 kev were used. The dose rate used at all energies was 3.5×10^{11} protons/cm^2-sec. Films of polyethylene terephthalate (Mylar) were irradiated with slow protons and the radioinduced changes of optical absorption were measured spectrophotometrically. A sharp absorption peak at 308 mμ and a broad absorption maximum at 250 mμ were found. The broad maximum was not observed after irradiation with 2-Mev protons, 3.4-Mev α particles, and ^{60}Co γ rays and is therefore attributed to the effect of elastic collisons between slow charged particles and atomic nuclei of the irradiated matter. The efficiency of the protons to produce the two maxima as measured in the energy range from 1 to 12 kev also indicates that the broad maximum at 250 mμ is caused by elastic nuclear collisions. After irradiation of the polymer film in an acid atmosphere the induced 250 mμ extinction change was smaller and the 335 mμ change larger than under anaerobic conditions. The chemical nature of the proton-induced changes was not examined. However, storage of the film in air for 8 weeks or heating it to 100° for 1 hr

did not cause the same spectral changes in the polymer as proton irradiation. (BBB)

35560 EFFECTS OF γ-IRRADIATION ON TRIGLYCINE SULFATE. Gonzalo, J. A. (Puerto Rico Nuclear Center, Mayaguez); Arndt, R. A. Contract AT(30-2)-Gen-16. Mol. Crystals, 1: 83-96(1965). (BNL-9181).

The effects of γ-irradiation below the Curie point on ferroelectric triglycine sulfate (TGS) were examined. Principal among these effects is the change, as a function of radiation dose, of the energy absorbed by a sample in going from the polar state to the non-polar state. This energy was found to be 0.73 cal/g for a virgin sample and 0.44 cal/g for a sample irradiated to 5×10^6 R. The shift of the Curie point toward lower temperatures (~5°C for 5×10^6 R) was found in the specific heat measurements as well as in the electrical measurements. The internal bias, which appears in the hysteresis loops of irradiated samples, was studied as a function of temperature, sample thickness, and time of application of the a-c measuring field. Both the internal bias and the coercive field exhibit a linear increase with increased γ dose. (auth)

35561 CORRELATION BETWEEN ELECTRON AFFINITY AND PROTECTION IN THE RADIATION CHEMISTRY OF HYDROCARBONS. Sherman, Warren V. (Soreq Nuclear Research Centre, Yavne, Israel). Nature, 210: 1285-6(June 18, 1966).

A linear correlation was found between the effect of the aromatic compounds and their electron affinities on the radiolysis of cyclohexane. Only in the case of the halobenzenes was there a significant deviation, indicating that the dissociation process is more important in the liquid phase than under gas-phase conditions. Evidence is given that thermal electrons are a precursor of a significant part of the hydrogen yield in the radiolysis of cyclohexane. (P.C.S.)

35562 EFFECTS OF NUCLEAR RADIATION ON COTTON CELLULOSE. Pande, A. (Shri Ram Inst. for Industrial Research, Delhi). Textile Rec., 82: 60-2(Aug. 1964).

Effects of β and γ radiation and thermal neutrons on the cellulose molecule are reviewed, and some results of 1-Mev electron and γ irradiation of cotton linters are reported. Scission of the chains of the cellulose fiber was the predominant reaction to radiation. The effects of irradiation on the decrease in the degree of polymerization was slight at a dose of 10^5 R, while pronounced changes occurred at irradiation levels in excess of 10^6 R. Depolymerization was not affected by crystalline organization. It was found that pure glucose and carbohydrate in cellulose are decomposed at the same rate. Increase in the hydrolysis rate or sugar yield requires that the average chain length be reduced to less than 200 glucose units. Maximum overall yield of sugar obtainable by the batch-wise dilute acid hydrolysis of irradiated cotton linters was about 65% which is nearly three times the yield obtainable from the control sample. Depolymerization of the cellulose chain and decomposition of fundamental glucose units occurred simultaneously but at different rates. An irradiation dose of 10^8 R produced in one g of cotton linters 1.02×10^{20} single depolymerization actions. The ratio of the number of glucose units destroyed to the number depolymerized was 5:1. (BBB)

35563 CHANGES OF CRYSTALLINITY AT RADIATION CHLORINATION OF POLYPROPYLENE IN SOLID PHASE. Dzhagatspanyan, R. V.; Korolev, B. M.; Sokolov, V. A.; Zetkin, V. I. Vysokomol. Soedin., 8: 1103-8(1966). (In Russian).

An x-ray study was made of changes of isotactic polypropylene crystallinity in solid-state gamma-induced chlorination. In chlorination the crystalline regions were highly degraded. In the initial stage the amorphous regions were chlorinated. (auth)

35564 RADIATION POLYMERIZATION OF MONOMERS IRRADIATED AT 4.2 DEG K. Barkalov, I. M.; Gareeva, D. A.; Gol'danskii, V. I.; Enikolopyan, N. S.; Berlin, Al. Al. Vysokomol. Soedin., 8: 1140(1966). (In Russian).

Acrylonitrile (AN) and hexamethylcyclotrisiloxane (HMCTS) were polymerized after irradiation at 4.2°K. The kinetic curves did not have an induction period. The initial polymerization rate of AN was less than the rate at 77°K; that of HMCTS on the contrary was many times higher. (auth)

35565 FOTOKHIMIYA I RADIATSIONNAYA KHIMIYA TVERDYKH NEORGANICHESKIKH VESHCHESTV. CHAST' PERVAYA. (Photochemistry and Radiation Chemistry of Solid Inorganic Substances. Vol. I. Sviridov, V. V. Minsk, Izdatel'stvo Vysshaya Shkola, 1964. 390p.

The radiation chemistry of solids relates primarily to the deep, radioinduced structural changes, during which new solid-phase molecules or particles are formed; it leaves consideration of radiation defects and their influence on the physical properties of the materials to radiation physics. Photochemistry may be regarded a special case of radiation chemistry and photolysis a specific instance of radioinduced decomposition, or radiolysis. A review is presented on the specific effects of radiation on solids by examining the radiolysis of the least stable classes of compounds, such as silver halides and other silver compounds, metal azides and nitrates, oxyhalides, and compounds of Zn subgroup elements. The reactions of the more recently studied compounds are also reviewed, describing the chemical effects of the irradiation of very low melting inorganic compounds and the chemical consequences of solid-state nuclear reactions. Special attention is devoted to the formation of color centers in alkali halides; color reactions and formation of radiation defects are also discussed, together with radiation aspects of surface chemistry and changes in catalytic activity. (403 references). (TTT)

35566 METHOD FOR PREVENTING AN ORGANIC MODERATOR FROM RADIATION DAMAGE. Kikuchi, Seishi (to Japan Atomic Energy Research Inst.). Japanese Patent 1965-3879. Mar. 1, 1965. Filed Nov. 27, 1962.

To prevent radiation damage, and hence the formation of harmful gases in an organic coolant or moderator a polyphenyl organic moderator is admixed with one or more species of excitation energy transfer compounds such as pyrene or anthraquinone and with one or more species of radical stabilizing compounds such as triphenylmethane, hydroquinone, or tetramethylthiuram disulfide. Such mixtures yield coolants and/or moderators that can be used for long periods of time without purification. (NSA of Japan)

Radiochemistry

See also Separation Processes and Procedures

Refer also to abstracts 35536 and 35801.

35567 (DP-1009) CURIUM PROCESS DEVELOPMENT. I. GENERAL PROCESS DESCRIPTION. Eubanks, I. Dwaine; Burney, Glenn A. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). Apr. 1966. Contract AT(07-2)-1. 22p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Chemical processing steps to purify ^{244}Cm produced in Savannah River reactors are described, and specifications on radioactive impurities in the product are stipulated. (auth)

35568 (IEA-103) SEPARACAO DO ^{32}P A PARTIR DE ENXOFRE IRRADIADO. (Separation of Carrier-Free ^{32}P From Irradiated Sulfur). Retter, Hermann K.; Pagano G. da Silva, Constancia (Instituto de Energia Atomica, Sao Paulo (Brazil)). Aug. 1965. 10p. Dep. mn.

A procedure designed for production of carrier-free ^{32}P by neutron irradiation of elemental sulfur is described. The ^{32}P is extracted from the irradiated sulfur by stirring with a hot hydrochloric acid-octanol mixture. The solution obtained is passed through a cationic resin for the separation of probable existing metallic impurities. The extraction yield is approximately 85%. (auth)

35569 (INR-674/XVI/J) STUDIUM NAD MOZLIWOSCIA SPRZEGNIECIA PRODUKCJI KWASU SIARKOWEGO METODA NITROZOWA Z PRODUKCJA AZOTU-15. (Investigation of the Possibility of Producing ^{15}N During the Production of Sulfuric Acid by Nitrox Method). Selecki, Anatol; Bulanda, Jan (Institute of Nuclear Research, Warsaw (Poland)). Dec. 1965. 16p. Dep.

For preparation of highly enriched ^{15}N by the NITROX method, approximately 50 kg of SO_2/g of ^{15}N is necessary for conversion of the liquid phase. The conversion process corresponds to the tower method of sulfuric acid production. The technical feasibility and economic suitability of the coupling of both processes were determined on the basis of existing assumptions. The production cost of the ^{15}N can be reduced to $3.98/g ^{15}N. (tr-auth)

35570 (MLM–1299, pp 17-21) ALPHA AND NEUTRON SOURCE DEVELOPMENT. (Mound Lab., Miamisburg, Ohio).

An examination was made of various neutron shielding materials from the viewpoints of optimum thermalization for counting purposes, for construction of a shield for elimination of extraneous neutrons for research purposes, and for health physics shielding. The first of these applications requires the lowest possible capture and the most desirable materials would be paraffin or polyethylene The second application requires a high degree of neutron absorption in addition to thermalization for which Cd provides an efficient absorber. For the third application, a B-loaded paraffin or polyethylene appears to be best because it adsorbs neutrons with a minimum of resultant gamma radiation. A procedure was developed for the preparation of high intensity Pu alpha sources. Twenty-two alpha sources from ^{238}Pu and ^{239}Pu were prepared with an intensity as high as 8.0×10^9 disintegrations per minute for the ^{238}Pu sources. Approximately 1 mg/cm^2 was placed in the sources for ^{239}Pu. The physical sizes vary from 1.0 in. dia. to 3.14 in. dia. with active areas of 1 cm^2 to 45 cm^2. The formation of a thin Au protective cover over the Pu deposited for the high intensity sources is being studied. (auth)

35571 TRITIATION OF ORGANIC COMPOUNDS. Wacker, A.; Traeger, L. (Johann-Wolfgang-Goethe-Univ., Frankfurt am Main). Abhandl. Deut. Akad. Berlin, Kl. Chem. Geol. Biol., No. 4, 283-6(1963). (In German).

Exposure of materials to $^3H_2$ (500 mg of compound, 3 C $^3H_2$) at 200 to 250 torr produced samples with the following specific activity: adenine, 11 mC/mmole; 2-aminopurine, 130 mC/mmole; sparteine sulfate, 20 mC/mmole; metrazol, 27 mC/mmole; kinetin, 107 mC/mmole; vitamin B_{12}, 360 mC/mmole; D- and L-penicillamine, 2-mC/mmole, all after 14 days exposure except the last (10 days). The intensity of incorporated activity depends on whether the compound is labeled in the pure state or in a mixture. The compound must contain H atoms which are neither hydrolizable, enolizable, or exchangeable by other mechanisms. Low activity is incorporated into methyl groups and strongly aromatic systems. The compound should not contain double bonds, which are partially hydrogenated under these conditions. The labeling is advisable for compounds chemically sensitive to the technique only when some method of purification is possible. (BBB)

35572 RADIOACTIVITY. Lenihan, J. M. A. (Regional Physics Dept., Glasgow). pp 3-7 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

The process of radioactivity is discussed, including forms of decay and detection methods. Methods of identifying decay processes are considered. (P.C.S.)

35573 ISOTOPE EFFECTS IN PROTON TRANSFERS. Saunders, W. H. Jr. (Univ. of Rochester, N. Y.). Chem. Ind. (London), No. 16, 663-4(Apr. 16, 1966).

Some calculations of hydrogen/deuterium isotope effects based on the linear three-center model: $B + HA \rightarrow [B \xrightarrow{F_{22}} H \xrightarrow{F_{11}} A] \rightarrow BH + A$ are presented. Values of isotope effects, when the donor atom (A) is changed from ^{12}C to ^{14}C, were calculated. Mechanistic conclusions from deuterium isotope effects are uncertain because a small effect can be associated with either a reactant-like or a product-like transition state. Isotopic substitution in the donor atom, A, seemed to offer a way of resolving this ambiguity, but calculations showed that the situation is not simple. A large carbon isotope effect (5% or more) is found only when the proton is more than half transferred ($F_{11} < F_{22}$), but a small effect (1% or less) could arise either from a transition state with the proton approximately half transferred ($F_{11} \sim F_{22}$), or from a large curvature parameter and almost any value of F_{11}/F_{22}. A suitable model must be able to account for the numerous cases in which k_H/k_D is substantially less than 6–8, and sometimes less than 2. Even with a small curvature parameter, F_{11}/F_{22} (or F_{22}/F_{11}) must exceed 10 to get k_H/k_D below 2, and for the larger curvature parameters it must exceed 100. The bending modes of the reactant or the transition state are also considered. The conclusion is that bending frequencies as high as 2000 cm^{-1} are reasonable. (BBB)

35574 STABILITY AND STORAGE OF COMPOUNDS LABELED WITH RADIOISOTOPES. Bayly, R. J.; Evans, E. A. (Radiochemical Center Amersham, Eng.). J. Label. Compounds, 2: 1-34(Jan.-Mar. 1966).

The decomposition by self-irradiation of compounds labeled with the radioisotopes, carbon-14, hydrogen-3 (tritium), sulfur-35, selenium-75, chlorine-36, phosphorus-32, iodine-125, iodine-131, cobalt-57, and cobalt-58 is reviewed. A discussion of the methods that can be used for control of this decomposition is also included. (74 references.) (auth)

35575 SYNTHESIS OF PHENYL-^{3}H-sec-BUTYL-$^{35}S_1$-DISULFIDE. Ayrey, G. (London Univ.). J. Label. Compounds, 2: 51-6(Jan.-Mar. 1966).

Phenyl-^{3}H-sec-butyl disulfide was synthesized via Wilzbach irradiated phenyl benzenethiolsulfonate and phenyl-sec-butyl-$^{35}S_1$-disulfide was synthesized via elemental sulfur-35. The two disulfides were mixed to give phenyl-^{3}H-sec-butyl-$^{35}S_1$-disulfide which was assayed by liquid scintillation counting. (auth)

35576 PREPARATION OF POTASSIUM HEXACYANOCOBALTATE(III) LABELLED WITH ^{58}Co AND ^{60}Co FOR HYDROLOGICAL STUDIES. Peisach, M. (Israel Atomic Energy Commission, Yavne). J. S. Afr. Chem. Inst., 18: 1-5(Apr. 1965).

Reactor-produced ^{58}Co, by the reaction $^{58}Ni(n,p)^{58}Co$, and ^{60}Co, by $^{59}Co(n,\gamma)^{60}Co$, were used to prepare tracer solutions of $K_3Co(CN)_6$ for hydrological studies. ^{58}Co was separated by anion-exchange resin with 9N HCl and eluted with 1N HCl. ^{60}Co was obtained by direct neutron irradiation of cobalt chloride. Batches containing up to 300 mC ^{60}Co were handled. (auth)

35577 PREPARATION OF STANDARD RADIOACTIVE PROTEIN COMPOUNDS. Bogolyubov, V. M.; Denisov, E. N. (Inst. of Medical Radiology, Academy of Medical Sciences, USSR). Med. Radiol., 11: No. 6, 85-6(June 1966). (In Russian).

The addition of human serum to a solution containing albumin labeled with ^{131}I was found to raise the counting rate of the preparation. This increase is acounted for by the fact that the addition of the carrier prevents precipitation of the radioactive protein onto the vascular walls. (auth)

35578 PRODUCTION OF CARRIER-FREE ^{52}Fe FOR MEDICAL USE. Silvester, D. J.; Sugden, J. (Hammersmith Hospital, London). Nature, 210: 1282-3(June 18, 1966).

A method was developed for preparing carrier-free samples of ^{52}Fe for medical use based on extraction from a solution in HCl of an α-bombarded Cr target using diisopropyl ether. The use of proportioning pump in the target etching and first extraction steps reduces the level of activity that must be handled from the equivalent of 100 mC of Ra to about 150 μC of ^{52}Fe. Some ^{55}Fe, an x-ray emitting isotope with a half life of 2.6 yr, is formed during

bombardment. To keep the $^{55}Fe/^{52}Fe$ ratio low in clinical use, time elapse between preparation and use is kept to a minimum; this entire chemical process may be completed in 3 hr. Extraction efficiency was determined by tracer experiments, using ^{59}Fe, to be >85%. (P.C.S.)

35579 MAGNITUDE OF THE HYDROGEN ISOTOPE EFFECT IN THE METALATION OF THIOPHENE. Shirley, D. A.; Barton, K. R. (Univ. of Tennessee, Knoxville). Tetrahedron, 22: 515-20(Feb. 1966).

The k_H/k_T ratio at 35° for metalation of thiophene containing tracer amounts of 2-tritiothiophene was reevaluated. Several precautions were taken to ensure that the difficulties inherent in earlier work were avoided. A determination of the isotope effect (k_H/k_T) for the metalation of 2-t-thiophene with n-butyl lithium gave a value of 16 ± 4 compared with the earlier value of at least 5.9. The k_H/k_D value for the same reaction was determined to be 6.6 ± 0.3 and this value leads to a calculated value, using the method of Swain, of 16 for k_H/k_T. These values accord with the complete loss of the carbon to hydrogen stretching vibration at the transition state of a protophilic metalation process. (TCO)

35580 A SYNTHESIS OF ^{14}C-LABELED PYRENE. Gerber, Rico P. (Philip Morris, Inc., Richmond, Va.). Va. J. Sci., 17: 40-5(Jan. 1966).

A sequence is presented for the preparation of ^{14}C-labeled pyrene. In this sequence, diphenoyl chloride (I) was used as the starting material, and double introduction of the label was accomplished with diazomethane-^{14}C, prepared from commercially available N-methyl-^{14}C-nitroso-p-toluenesulfonamide. Experiments were carried out using unlabeled diazomethane to establish conditions and yields. Thus, I was homologized with diazomethane-^{14}C and converted by the modified Wolff rearrangement to labeled biphenyl-2,2′-diacetic acid. Ring closure by hydrofluoric acid was followed by reduction with red phosphorus and hydriodic acid. The Arndt-Eistert synthesis of 2,2′-bis (diazoacetyl)-biphenyl (II) from I was modified by using triethylamine to absorb liberated hydrochloric acid to conserve the diazomethane. The yield of II was about 80%. Use of silver benzoate in triethylamine (the modified Wolff rearrangement) gave the highest yield (30–42%) of biphenyl-2,2′-diacetic acid (III) via the diethyl ester. Double cyclization of III to yield 4,9-dihydroxypyrene was effected with aluminum chloride and more effectively, by using liquid hydrofluoric acid. In the final run, 0.004 mole of N-methyl-^{14}C-N-nitroso-p-toluene-sulfonamide having an activity of 1.0 mC was used with 0.001 mole of I. The overall yield of pyrene-4,9-^{14}C was 5.0%. The pyrene had a total activity of 28.85 μC, corresponding to a sp act of 490 μC/mmole. (BBB)

Separation Processes and Procedures

See also Analytical Procedures
ISOTOPE TECHNOLOGY — Separation and Production

Refer also to abstracts 35696–35699, 35701–35703, and 35764.

35581 (ANL-7165) TABLES FOR THE CALCULATION OF OPERATING PARAMETERS FOR COMPOUND SOLVENT-EXTRACTION COLUMNS. Johnson, Terry R.; Clark, Nelda K. (Argonne National Lab., Ill.). Feb. 1966. Contract W-31-109-eng-38. 157p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

A set of tables is presented to assist in the calculation of the solvent flow rates and the number of theoretical stages that will effect a specified separation between two distributing solutes in a countercurrent, fractional-extraction column in which the distributing components are introduced on an intermediate plate. The procedure that is outlined is an extension of the Kremser-Brown equation, which applies to extraction columns that have feeds only at the top and bottom. Similar assumptions are required; distribution coefficients and solvent flow rates are constant above and below the feed. Additional tables are presented for use with equations that relate column parameters when distributing components are also fed to the top or bottom of a compound extraction column. A sample problem is described which is applicable to a high-temperature liquid metal-liquid salt extraction process for separating rare-earth fission products from U and Pu. However, the computational procedure is applicable to any system in which the simplifying assumptions are reasonably accurate. The procedure is rapid and straightforward. (auth)

35582 (BAW-279) THEORETICAL STUDIES FOR A MULTIPURPOSE, SINGLE-CYCLE SOLVENT EXTRACTION PLANT FOR NUCLEAR FUEL REPROCESSING. Burkart, C. A.; Moncrief, E. C.; Sweeney, T. L. (Babcock and Wilcox Co., Lynchburg, Va.). June 1965. 116p.

A study was conducted to determine the theoretical requirements of a multipurpose, single-cycle, solvent extraction plant for the reprocessing of three fuel mixtures — thorium–uranium, plutonium–uranium, and thorium–plutonium–uranium. The primary objective was to determine the optimum number of theoretical extraction stages required to extract and partition the fuel components in a reprocessing plant. Other objectives included calculation of pulsed column heights and operability diagrams for the systems. It was determined that a multipurpose, single-cycle solvent extraction plant is feasible for processing the three fuel types. However, certain qualifications were imposed on the study: that the plutonium and uranium in the three-component system need not be partitioned; that if this partition should be desired, a one-fourth increase in stage requirements would not be prohibitive; and that polymerization of plutonium in the low-acid three-component system could be prevented during plant operation. Recovery of fertile and fissile components was demonstrated in a reasonable number of theoretical extraction stages. For example, a single-cycle process (extraction, partition, and stripping) requires 22 stages for Acid-Thorex, 23 stages for Purex, and 26 stages for separation of thorium from plutonium(IV)–uranium. Partition of plutonium(III) from thorium–uranium was investigated, but was determined to be difficult to perform because of the limited operability region for this separation. A theoretical treatment is presented in detail for calculating the stage requirements, pulse column heights, and operability diagrams for each of the above systems. (auth)

35583 (BNL-968) FLUIDIZED-BED REPROCESSING OF STAINLESS STEEL CLAD UO_2 POWER REACTOR FUELS. Bartlett, C. B.; Wirsing, E. Jr.; Wachtel, S. J.; Johnson, R.; Reilly, J. J.; Hatch, L. P. (Brookhaven National Lab., Upton, N. Y.). Nov. 1965. Contract AT(30-2)-Gen-16. 15p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A fluidized bed volatility process for recovery of uranium from stainless steel clad UO_2 reactor fuels was developed at Brookhaven National Laboratory. The process involves two steps: a head-end step in which the cladding is removed from the fissile material by reaction with a mixture of HF and O_2 at 600°C; and a recovery step whereby the exposed uranium is converted to volatile UF_6 by reaction with fluorine at 450 to 500°C. Average penetration rates in excess of 60 mils per hour were achieved in the decladding step and uranium recoveries were greater than 99%. (auth)

35584 (BNL-973) REPROCESSING OF NUCLEAR FUELS BY VOLATILITY SEPARATIONS IN FLUIDIZED BEDS. Wachtel, S. J.; Reilly, J. J.; Bartlett, C. B.; Johnson, R.; Wirsing, E. Jr. (Brookhaven National Lab., Upton, N. Y.). Mar. 1966. Contract AT(30-2)-Gen-16. 10p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Results of studies concerning the basic steps in fluidized-bed volatility processes for reactor fuels are presented. In general, the operations required include a head-end reaction at elevated temperatures in which the fuel cladding

or matrix material is disintegrated or volatilized, and a reaction with F_2 at temperatures as high as 550°C in which the fissile material is recovered as the volatile hexafluoride. (J.R.D.)

35585 (EURAEC–1639) PLUTONIUM PURIFICATION WITH ION EXCHANGE RESINS. Special Report No. 1. (Centre d'Etude de l'Energie Nucleaire, Brussels (Belgium). Societe Belge pour l'Industrie Nucleaire, Brussels). Sept. 1965. Contracts 027-60-7RDB; 096-62-12RDB; 001-64-1TRUB. 143p. (EUR–2840). Dep. mn. CFSTI $4.00 cy, $1.00 mn.

Work Performed under United States–Euratom Joint Research and Development Program.

The loading conditions of plutonium from nitric acid-hydrofluoric acid solutions, free from metal impurities (about 5 to 110 g Pu/l; about 7.5 and 11M HNO_3) on Permutite SK (20-50 and 40-70 mesh), Dowex 1 X1, X4, X10, Amberlite IRA 400, and Dowex 50 resin columns, thermostatized at 60°C is described. The washing operation and elution conditions of the adsorbed plutonium are considered. In order to explain experimental data, a theoretical interpretation of the exchange kinetics during loading and elution is given. The loading, washing, and elution conditions of plutonium by means of an identical resin column, but fed with nitric acid solutions (7 and 11M) containing metal impurities such as zirconium, iron, uranium, molybdenum, etc., in variable ratios are discussed. The behavior of these elements was particularly studied during the washing operation. The decontamination factors obtained after one or two purification cycles are also reported. (auth)

35586 (EURAEC–1646) REPROCESSING OF IRRADIATED FUELS. Quarterly Report No. 23, October 1–December 31, 1965. (Centre d'Etude de l'Energie Nucleaire, Mol (Belgium)). Contracts 006-65-7RCIB(RD); 016-65-1RAP-B. 60p. (EUR–2844; R–2370). Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Work Performed under United States–Euratom Joint Research and Development Program.

Chemical decladding experiments showed that an equimolecular mixture of hydrogen fluoride and oxygen at 550°C may be adopted as the operating conditions for treating AISI 304, 304 L, and 316 stainless steels and Zircaloy 2 and 4. AISI 348 stainless steel reacts much more slowly. In addition, it was possible to fluidize alumina in the presence of small subassemblies in a dense lattice. Laboratory-scale research on the behavior of powders derived from compact mixed dioxides was continued. A study was made of the conditions required to avoid surface sintering of the powders. The volatilization percentage of uranium acted on by chlorine trifluoride was high after a 3-hr treatment at 105°C. High plutonium contents had an unfavorable effect on the volatilization rate, but this effect was only significant with plutonium concentrations of more than 20%. Powders in oxide form (U_3O_8) were better suited to this reaction than hydrofluorinated powders. In addition, thermogravimetric and analytical research confirmed the formation of intermediaries, probably UF_4, UF_5, and UO_2F_2, during the reaction between UO_2 and chlorine trifluoride. With this reagent, it was found that the reaction rates of powdered UO_2 and U_3O_8 are of the same order of size. Technological tests showed that, at 100°C, the density of the UO_2 (in pellet form) has an unfavorable effect on the reaction rate with chlorine trifluoride. At 300°C the surface exposed to the reagent plays a more important part than density as regards the reaction rate. A further set of experiments confirmed the favorable influence of the depth of the sintered UO_2 layer on the fluorine efficiency (of the ClF_3) and the reaction rate. The addition of fluorine to chlorine trifluoride allows the latter to be reformed from the products of its reaction with UO_2; it also produces an increase in the rate and efficiency. The unfavorable effect of alumina and fissium on the reactor rate of chlorine trifluoride is apparent with and without fluorine. Chemical attack on compact uranium monocarbide with mixtures of hydrogen fluoride and oxygen is extremely sensitive to the relative concentration of the gases, and to the temperature. Oxygen contents of 20 to 40% and high temperatures encourage the elimination of carbon and the formation of UF_4. Atomization is also satisfactory under these conditions. However, in view of the high exothermicity of the reaction, it is hard to extrapolate laboratory-obtained atomization results on to a larger scale. During research on the transformation of fluorides into oxides, it was shown to be possible to filter oxide particles of up to 0.1 μ in a molten salt medium. (auth)

35587 (IEA–101) APPLICATION OF ION EXCHANGE RESINS TO THE SEPARATION OF CARRIER-FREE FISSION PRODUCTS. Abrao, Alcidio; Nastasi, M. J.; Laranja, Almir A. (Instituto de Energia Atomica, Sao Paulo (Brazil)). Aug. 1965. 20p. Dep. mn.

A radiochemical procedure for separation of radioisotopes with medium and long half lives is described. The procedure was designed for recovery of carrier-free fission products in irradiated uranium. The radioisotopes ^{137}Cs, ^{89}Sr, ^{90}Sr, and the rare earths were separated with a cationic resin, while ^{95}Zr, ^{95}Nb, and ^{103}Ru, ^{106}Ru were sequentially separated using an anionic resin. Pellets of U_3O_8 were irradiated with neutron for 15 or 200 hours and cooling times of 8 months or more were allowed. The pellets were dissolved in nitric acid and the uranium was extracted with TBP–CCl_4. Oxalic acid was added to the rafinate and then the mixture was distilled to approximately 5 ml. The residue was dissolved in 0.1M HCl and the acidity adjusted to 0.4M in oxalic acid. The fission product mixture was passed through a Dowex 50-X8, H-form cationic resin, where ^{137}Cs, ^{89}Sr, ^{90}Sr, and the rare earths ^{141}Ce, ^{144}Ce, ^{144}Pr, ^{90}Y, ^{91}Y, and ^{147}Pm were sorbed. The column was washed with 0.4M $H_2C_2O_4$–0.1M HCl and then ^{137}Cs, ^{89}Sr and ^{90}Sr, and the rare earth elements were eluted with hydrochloric acid of 1.0, 1.5 and 6.0M, respectively. The cationic column effluent, containing ^{95}Zr, ^{95}Nb, ^{103}Ru, and ^{106}Ru was percolated in a Dowex 2-X8 anionic column previously conditioned with oxalic acid. ^{95}Zr and ^{95}Nb were eluted with 1.0M HCl–0.01M $H_2C_2O_4$ and finally ^{103}Ru, and ^{106}Ru were eluted with 3.0M HNO_3. The radiochemical purity was verified by gamma spectrometry. (auth)

35588 (LA–3503) TRIBUTYL PHOSPHATE EXTRACTION OF URANIUM(VI) TRICHLOROACETATE. Coleman, James S.; Chisholm, Ronald C. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). Mar. 1966. Contract W-7405-eng-36. 11p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Uranium(VI) is strongly extracted by 40% tributyl phosphate in hexane from aqueous sodium trichloroacetate. The extraction is suppressed sharply by addition of trichloroacetic acid. Typical values of the U(VI) distribution coefficient (organic/aqueous) are 838 at 0.01M trichloroacetic acid–0.29M sodium trichloroacetate and 5.1 at 0.30M trichloroacetic acid. A spectrophotometric method is described for determination of distribution coefficients without separate measurement of extinction coefficients. (auth)

35589 (NP–16170) UEBER DAS ELEKTROCHEMISCHE VERHALTEN DES URANS ALS KATHODE UND DIE ELEKTROLYTISCHE ABLOESUNG VON SPALTPRODUKTEN. (Electrochemical Behavior of Uranium as Cathode and the Electrolytic Dissolution of Fission Products). Weber, Max (Mainz Univ. (West Germany). Naturwissenschaftliche Fakultaet). 1965. 194p. Dep. mn.

Thesis.

The fractional electrolytic dissolution of radionuclides was investigated with regard to a rapid separation of fission products. Uranium foils were used as electrodes. The active-passive behavior of uranium cathodes at potentials between –0.6 and +0.6v was studied in acids, neutral solutions, and dilute bases. With increasing positive potential, in acid electrolytes the dissolution of uranium constantly decreased by passivation of the metal until a minimum was reached at about +0.4v. By x-ray analysis it could be proved that the passive layer consists of UO_2. Above +0.4v a sharp increase of uranium dissolution was observed, probably due to the reaction UO_2 →

$UO_2^{2+} + 2e^-$. The electrode potential for this reaction found by extrapolation of the dissolution curve was +0.48v. In dilute alkaline solution the dissolution curve shows a maximum at +0.2v, i.e., passivity was suspended by the transition of UO_2 into higher-valent uranium oxides. The influence of adsorption and desorption effects on electrolytic dissolution in highly dilute solutions was studied. Deposition of thallium on platinum electrodes occurred at potentials considerably lower than calculated because of a potential-dependent adsorption process. By cathodic adsorption the concentration of thallium in highly dilute solutions can easily be determined. In the case of tellurium deposition the adsorption mechanism seemed to prevail over the true electrochemical deposition. Desorption of tellurium and thallium became effective at potentials, which, in comparison with the adsorption process, are strongly shifted in noble direction. The dissolution kinetics obtained for the electrolytic separation of the tellurium-iodine pair is in agreement with the analogously applied relations for the electrolytic deposition. However, the resulting half lives of dissolution are considerably longer ($t_{½} \simeq 85$ min). The dissolution of fission products from irradiated uranium cathodes does not prove to be of sufficient selectivity. Both total fission product activity and yields of Te, Mo, and Ba are proportional to the amount of uranium dissolved. Also by dissolution of a fission product mixture from platinum or graphite electrodes no selectivity was achieved, except for Zr and Nb, which are dissolved with some delay on account of hydrolysis. The presumable reason for the nonselective dissolution is the disability of the single fission elements to form characteristic deposition potentials because of their extremely low concentration. In the case of dissolution of fission products from uranium electrodes additional complications arise from a constant change of surface and locally different electrode potentials. (auth)

35590 (ORNL–3977) OXIDATION AND CHLORINATION OF UO_2–PuO_2. Warren, K. S.; Ferris, L. M. (Oak Ridge National Lab., Tenn.). July 1966. Contract W-7405-eng-26. 29p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Oxidation and chlorination of UO_2-PuO_2 was studied on a laboratory scale. High-density pellets of UO_2-PuO_2 that contained less than 20% PuO_2 usually could be converted to U_3O_8-PuO_2 powder by reaction with O_2 at 600°C. The UO_2 in pellets containing 20% or more PuO_2 could be partially oxidized; however, oxidation was always incomplete even on extended exposure to O_2 at 800°C. No powdering of the high-PuO_2-content pellets was observed. After experimentation, 85% Cl_2–15% CCl_4 was selected as a chlorinating agent. At 450 to 550°C, the rates of conversion of uranium oxides to volatile chlorides (UCl_5 and UCl_6) were about the same for small, high-density UO_2-PuO_2 pellets containing 5% PuO_2 or less as those obtained with U_3O_8-PuO_2 powders produced by oxidizing pellets. U from pellets of higher PuO_2 content was chlorinated less readily. U chlorination efficiency was unaffected by changes in PuO_2 content (0 to 20%) of U_3O_8-PuO_2 powders. At 550°C, complete conversion of U_3O_8 to volatile chlorides required 3 to 5 hr in an excess of chlorinating agent. Liquid oxychlorides formed at temperatures above about 550°C. The amount of PuO_2 converted to volatile $PuCl_4$ was proportional to the amount of Cl_2 passed through the system. This behavior was predictable from the equilibrium constant for the reaction $PuCl_{3(s)} + ½Cl_2 \rightleftharpoons PuCl_{4(g)}$. Large amounts of Cl_2 were required to volatilize Pu. At 500 to 600°C, about 10^4 moles (about 10^5 liters) of Cl_2 were required to volatilize one mole of $PuCl_4$. It was concluded that chloride volatility processes for recovering U and Pu from nuclear reactor fuels are not technically attractive. (auth)

35591 (ORNL-TM-1506) CALCULATION OF FISSION-PRODUCT RADIOACTIVITY IN OFF-GASES FROM A BURN-LEACH PROCESS FOR GRAPHITE-BASE FUELS. Witte, H. O. (Oak Ridge National Lab., Tenn.). Apr. 27, 1966. Contract W-7405-eng-26. 14p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Equilibrium concentrations of fission product oxides in O_2 were calculated from thermochemical data. The calculations showed that, at high temperatures, an appreciable amount of fission product oxides can be expected in the off-gas from a burn-leach process for HTGR fuel. Cooling the off-gas to room temperature should condense practically all the volatile oxides since the equilibrium constants are highly temperature dependent. If the condensed oxides can be removed from the off-gas by efficient filtration or scrubbing, the remaining radioactivity in the gas would be due predominantly to ^{85}Kr. Stack-dilution calculations showed that, even under adverse conditions, the off-gas can probably be released by a 100-m stack without further dilution. (auth)

35592 (SGAE-CH–29/1966) DIE HERSTELLUNG SPHAERISCHER KERNBRENNSTOFFTEILCHEN AUS WAESSERIGEN METALLSALZLOESUNGEN. (Preparation of Spherical Nuclear Fuel Particles From Aqueous Metallic Salt Solutions). Bildstein, H.; Knotik, K.; Leichter, P. (Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf). 1966. 24p. Dep. mn.

The methods described for the preparation of spherical carbide and mixed carbide particles from salt solutions was developed as a short and economical method for reprocessing of spent fuel elements. It was established that the principle of the process can be very generally applied so that both metallic salt solutions and colloidal brines can be processed. With suitable apparatus small samples and large masses could be prepared. An improvement of the carbide properties could be obtained by variations of the conditions in the meltcarbonizing process. The process is in the test stage. (tr-auth)

35593 ION-EXCHANGERS CONTAINING PHOSPHORUS IN THEIR FUNCTIONAL GROUP. SORPTION OF CATIONS FROM NITRIC ACID SOLUTIONS AND FROM ACETATE MEDIUM. Marhol, Milan (Nuclear Research Inst., Rez, Czech.). J. Appl. Chem. (London), 16: 191-6 (June 1966).

Selective sorption of uranyl ions on organic ion exchangers containing $-OPO(OH)_2$ or $-PO(OH)_2$ groups from dilute nitric acid solution and the affinity of various divalent cations to these groups in acetate medium were studied. Practical applications of these ion exchangers for separation are described. (auth)

35594 RAPID SEPARATION OF SHORT-LIVED XENON NUCLIDES FROM A URANIUM–FISSION PRODUCTS MIXTURE BY SOLVENT EXTRACTION. Hamaguchi, H.; Onuma, N.; Tomura, K.; Kuroda, R. (Tokyo Univ.). J. Inorg. Nucl. Chem., 28: 1501-8(Aug. 1966).

A rapid radiochemical separation of xenon nuclides produced in uranium fission can be achieved by solvent extraction from aqueous solution using carbon tetrachloride, followed by the stripping of foreign activities, primarily of iodine, with water containing a few drops of 1M $NaHSO_3$. Gamma rays with energies of 30 and 80 kev for ^{133}Xe, 0.25 Mev for ^{135}Xe, 0.53 Mev for ^{135m}Xe, 0.25 and 0.46 Mev for ^{137}Xe and 0.25, 0.45, 0.51, 1.78 and 2.01 Mev for ^{138}Xe were observed in the organic phase. These data were compared with current literature values. (auth)

35595 TRACE ELEMENT EXTRACTION BY MIXED ION EXCHANGE RESINS. Eichholz, G. G.; Galli, Ann Nagel; Hughes, R. B. (Georgia Inst. of Tech., Atlanta). J. Inorg. Nucl. Chem., 28: 1715-22(Aug. 1966).

Mixed-bed ion exchange resins were used to extract traces of fission products and other elements from aqueous solutions. A slurry method was used in preference to column extraction and was found to be faster and as efficient. By using a 2:1 ratio of cation to anion resin, the pH of the solution was kept low enough to minimize colloid formation and beaker adsorption. The pH variation for 1:1 mixtures exhibited several interesting features, including an unexplained long-period decline in pH value. (auth)

35596 ANION EXCHANGE BEHAVIOR OF THE TRANSPLUTONIUM ELEMENTS WITH ETHYLENEDIAMINETETRA-ACETIC ACID. Baybarz, R. D. (Oak Ridge National

Lab., Tenn.). Contract W-7405-eng-26. J. Inorg. Nucl. Chem., 28: 1723-31(Aug. 1966). (ORNL-P-1466).

Transplutonium elements form a singly negatively charged complex ion with ethylenediaminetetraacetic acid (EDTA). The separation factors of the various complex ion pairs (Fm/Es, 1.90; Es/Cf, 1.42; Cf/Cm, 1.63) in anion exchange resin systems were independent of the complex ion dissociation constant, and appeared to be strongly dependent on its size. The separation factors varied with different resins and were not affected by considerable quantities of elements such as Na, K, Li, Ca, and Al. (auth)

35597 CATALYSIS IN THE REDUCTION OF PLUTONIUM(IV) BY URANIUM(IV). Biddle, P.; Miles, J. H.; Waterman, M. J. (Atomic Energy Research Establishment, Harwell, Eng.). J. Inorg. Nucl. Chem., 28: 1736-9 (Aug. 1966).

The rate of Pu(IV) reduction by U(IV) in reprocessing nuclear fuels was studied in aqueous and organic solutions containing nitric acid, using a polarographic technique. In 2.0M $HClO_4$ the rate was 3.8 times greater than that reported earlier (Newton, J. Phys. Chem. 63: 1493(1959)). A trend to lower rate constants at higher U(IV) content in 2.036M perchloric acid was attributed to experimental error. Rate constants were not independent of acid concentration. No catalytic effect was found due to platinized platinum, extra pieces of glass sinter impregnated with silica gel, uv light, barium sulfate, or barium nitrate. Uranium(IV) (4×10^{-3}M), ferrocyanide (5×10^{-5}M), and silicate (1.2×10^{-3}M) were also without effect. Cr(III) exerted a catalytic effect sufficient to multiply the rate by a factor of about 1.05 at a concentration of 1.5×10^{-3}M. Powerful catalysis by inorganic phosphate showed correlation between charge on an anion and degree of catalysis observed. (P.C.S.)

35598 GAS-SOLIDS REACTIONS IN STIRRED BEDS. I. THE HYDROGEN REDUCTION OF URANIUM TRIOXIDE. Taylor, R. F.; Dell, F. R. (Atomic Energy Research Establishment, Harwell, Eng.). Trans. Inst. Chem. Eng. (London), 44: T97-T104(Apr. 1966).

Hydrogen reduction of uranium trioxide to the dioxide in screw-flight stirred beds was studied. A diagram of the reduction plant is shown. Uranium trioxide is taken by screw-feeder into the electrically heated reactor tube (60 in. long by 2 in. dia of 18/21/1 stainless steel). It is then carried by screw stirrer into the reaction zone proper for reduction by the countercurrent stream of hydrogen and heated to 380°C before passing through the reactor, from which the excess gas carries off the water vapor produced by the reaction. The temperature profile of the solid reactant as it moved along the reactor and its mean residence time in the reaction zone were determined with reasonable accuracy. This provided the basis for an analysis of results in terms of the mean residence time and the isokinetic temperature of the solids, covering a wide range of degrees of conversion and reaction rates. The absence of diffusional resistance in the gas phase demonstrated that contacting between solids and gas in the stirred bed is excellent and is adequate to cope with activated feed materials. (TCO)

35599 GAS-SOLIDS REACTIONS IN STIRRED BEDS. II. THE HYDROFLUORINATION OF URANIUM DIOXIDE AND A STUDY OF REACTOR EFFICIENCIES. Taylor, R. F.; Dell, F. R. (Atomic Energy Research Establishment, Harwell, Eng.). Trans. Inst. Chem. Eng. (London), 44: T105-T15(May 1966).

The hydrofluorination of uranium dioxide to uranium tetrafluoride in an electrically heated reactor tube was studied. Uranium dioxide was hydrofluorinated in a continuous stirred-bed reactor, yielding products containing only 0.1% uranium dioxide and with less than 0.5% hydrogen fluoride remaining in the exhaust gas. The experimentally obtained energy of activation of 9.5 kcal/g mole and the overall reaction rates as measured in this reactor agree with values obtained for the early stages of the reaction when measured in a lab thermobalance. In the hydrofluorination reactor, resistance to mass transfer in the bulk gas phase is insignificant under all operating conditions examined, and reaction rates are correspondingly high. It was concluded that the combination of transport characteristics and temperature profiles make stirred beds well suited to continuous processes for the reaction of solids where extended or well-defined residence times are required, where high levels of conversion are desired in either the solid or the gas phase or both, and where two or more reaction steps may be involved. (TCO)

ENGINEERING

General

Refer also to abstract 35600.

35600 (ORNL–3951, pp 164-8) STUDIES FOR ADVANCED SYSTEMS. Perry, A. M.; Witt, F. J. (Oak Ridge National Lab., Tenn.).

A nozzle-to-spherical shell attachment configuration was examined. The experimental and theoretical results are in satisfactory agreement, with two exceptions: the circumferential stresses on the inner surface of the sphere and the meridional stresses on the outer surface of the sphere. (M.O.W.)

35601 (SC-R–66-914) FUNCTIONAL GAGING WITH OPTICAL PROJECTORS. Roth, E. S. (Sandia Corp., Albuquerque, N. Mex.). Apr. 1966. Contract AT(29-1)-789. 7p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A discussion is presented on the direct application of functional gaging principles to the inspection of watch-size parts that can be staged on optical projectors. (B.G.D.)

35602 (TUBIK–1) BERICHT UEBER FORSCHUNGSARBEITEN, 1963–1965. (Report on Research Work, 1963–1965. (Technische Universitaet, Berlin (West Germany). Institut fuer Kerntechnik). Mar. 1966. 92p. Dep. mn.

A series of three reports from the Institute for Nuclear Technology of the Technical University of Berlin are compiled. Individual abstracts were prepared for each. (J.S.R.)

For abstracts of individual sections see: 35609, 35623, and 35624.

Applications of Nuclear Explosions

35603 (CONF-660114–1) NUCLEAR BLASTING AND ITS POTENTIAL FOR STRIPPING OVERBURDEN. Russell, Paul L. (Bureau of Mines, Washington, D. C.). Dec. 1965. 17p.

From 27th Annual Mining Symposium, Duluth, Minn.

The use of nuclear explosives for excavation was demonstrated to be feasible and practical. Application of nuclear explosives for overburden removal from large ore deposits appears to offer an economic advantage over present methods, but under the present pricing schedule, high-yield devices must be used to obtain an economic advantage. The use of nuclear explosives presents problems not inherent in the use of conventional explosives, thus they can be used only in areas where large explosions and associated phenomena can be tolerated. Stripping overburden from copper or iron ore deposits may be a potential use. However, the use of nuclear explosives would require isolation, favorable topography, favorable groundwater conditions, and a low population density. If these basic requirements can be met, the use of nuclear explosives for overburden removal is considered to offer both economic and time advantages. (auth)

35604 (PNE–515) SUBSURFACE EFFECTS MEASUREMENTS. Project PRE-SCHOONER II. Final Report. Heusinkveld, Myron; Marks, Robert (Lawrence Radiation Lab., Univ. of California, Livermore). Jan. 1966. Contract W-7405-eng-48. 41p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Subsurface effects measurements were made on the Pre-Schooner II event, which was an 85-ton nitromethane cratering experiment in southern Idaho. Measurements attempted included subsurface stress, time of arrival of the stress wave, acceleration, subsurface spall phenomena, gas pressure in the expanding detonation cavity, and vertical subsurface motion. The measured subsurface stresses were of essentially the same scaled amplitude as earlier results from Sulky and Palanquin, but were considerably lower than results from Hardhat and Shoal. Measured accelerations were higher in scaled amplitude than the results from Danny Boy, but were lower than the results from Hardhat. A subsurface spall was observed 8 meters below the surface 18 msec after detonation time. Early cavity pressure measurements were obtained, but the instrumentation failed before the time of greatest interest. The vertical subsurface motion experiment was unsuccessful. (auth)

35605 (UCRL–12172) NUCLEAR CRATERING EXPERIENCE AT THE PACIFIC PROVING GROUNDS. Circeo, Louis J. Jr.; Nordyke, Milo D. (Lawrence Radiation Lab., Univ. of California, Livermore). Nov. 10, 1964. Contract W-7405-eng-48. 92p. Dep. mn. CFSTI $2.00 cy, $0.75 mn.

A report is presented on a study conducted to observe the long-term effects of weathering on 10 nuclear craters over periods as long as 12 years. The study consisted of an investigation and resurvey of selected craters on Bikini and Eniwetok Atolls, including documentary photography; hydrographic, topographic, and geologic data; and general engineering observations. These data were compared with information collected from previous pertinent reports and studies. A summary of all the data from previous and present studies is included. Cratering curves for these surface detonations are developed, based primarily on the empirical data. Crater radius is shown to scale as $W^{3.4}$, similarly to the observed scaling dependence of other fireball phenomena. Crater depth after water washing was shown to scale as $W^{1/4}$. The effect of low heights of burst appears to be relatively minor in determining crater dimensions. Changes in crater topography are noted and investigated. The alteration of shoreline processes as a result of nuclear craters is discussed. The comparison of craters formed by surface and subsurface detonations and subsequent phenomena is considered. (auth)

Facilities and Equipment

Refer also to abstract 35387.

35606 (BNL–10257) STATUS OF GAMMA IRRADIATOR DESIGN. Manowitz, Bernard (Brookhaven National Lab., Upton, N. Y.). Apr. 1966. Contract AT(30-2)-Gen-16. 39p. (CONF-660903–1). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

For Presentation at American Inst. of Chemical Engineers Meeting, Atlantic City.

The status of gamma irradiator design for the destruction of bacteria and insects and for the initiation of chemical reactions is reported. (B.G.D.)

35607 (CNLM–5354 (Suppls. 1 and 2)) SPECIFICATION FOR HIGH-FREQUENCY LINEAR INDUCTION ELECTROMAGNETIC PUMP. Walton, J. W.; Edgerly, G. E. (comps.) (Pratt and Whitney Aircraft, Middletown, Conn. Connecticut Advanced Nuclear Engineering Lab.); Gahan, J. W. (General Electric Co., Schenectady, N. Y. Atomic Motor Product Section). Nov. 11, 1963. Contract AT(30-1)-2789. 81p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

The design of a lightweight 400 cps linear induction electromagnetic pump which meets very stringent performance specifications, in particular, efficiency, power factor, and weight requirements, is presented. Engineering drawings are included. (M.O.W.)

35608 (DP-MS–66-52) PERFORMANCE OF AIRBORNE ACTIVITY CONFINEMENT SYSTEMS IN SAVANNAH RIVER PLANT REACTOR BUILDINGS. Durant, W. S. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). July 14, 1966. Contract AT(07-2)-

1, 23p. (CONF-660904-2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

For Presentation at 9th Air Cleaning Conference, Boston.

A filtration-adsorption system is installed in the ventilation exhaust of each reactor building at the Savannah River Plant for confinement of airborne particulate and iodine vapor activity that might be released in the highly unlikely event of a reactor accident. Air from the process areas of each building is passed continuously through moisture separators, then through particulate filters, and finally through iodine adsorber beds of activated carbon. The units have the demonstrated ability to collect over 99% of airborne particulate activity and over 99.9% of airborne halogen activity under emergency conditions. A continuing program of development, testing, and maintenance ensures that these high efficiencies will be maintained during operation. Experience has been satisfactory for over 3 years of operation. (auth)

35609 (TUBIK–1, pp 73-92) OPTIMIZING THE COOLING OF LIQUID-METAL PUMPS WORKING AT HIGH TEMPERATURES. Wesser, Ulfried (Technische Universitaet, Berlin (West Germany). Institut fuer Kerntechnik). (In German).

A cooling system for electromagnetic pumps is described. Fluid-temperatures above 1000°C are allowed without remarkable decrease of pump efficiency. Monograms are given to determinate maximal yoke-temperature in dependence of various parameters. The design of an optimal cooling system by a graphical method is shown. (auth)

35610 (Y–1547) SPECIAL MACHINE TOOL SLIDE BEARING MATERIAL. Asmanes, Charles (Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant). July 20, 1966. Contract W-7405-eng-26. 9p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Many machine tools at the Oak Ridge Y-12 Plant have been equipped with Teflon wear pads under the slides. The material has minimized the amount of maintenance work and eliminated troublesome lubrication problems. Teflon is easily applied to machine ways, usually by clamping the material under the wiper pads. (auth)

35611 GAMMA IRRADIATION FACILITIES USING SPENT FUEL ELEMENTS. O'Leary, B. M. (Australian Atomic Energy Commission). At. Energy Austral., 9: No. 2, 7-11(Apr. 1966).

The procedure for using spent fuel elements from a nuclear reactor as a gamma radiation source at the Australian Atomic Energy Commission's Research Establishment, Lucas Heights, is discussed. The construction of an irradiation pond, the radiation field measurements, methods of irradiating materials, and a list of materials commonly irradiated are given. (D.H.M.)

35612 ION SPUTTERING AT LOW PRESSURES WITH THE DUOPLASMATRON. Gaydou, F.; Trendelenburg, E. A. 11p. (CONF-651046–5). ORAU. Gmelin, AED-CONF-65-403-7.

From 12th National Symposium of the American Vacuum Society, New York.

A duoplasmatron ion source was built which enables sputtering at low pressures. The most important features of the experiments were the following: (1) Ar atoms were ionized in the duoplasmatron, (2) by means of an auxiliary magnetic field the whole neutral plasma beam leaving the duoplasmatron could be lead to the neighborhood of the sputtering target, (3) a potential was applied between the plasma boundary and the target in order to accelerate ions on that target, and (4) the ions neutralized at the target were pumped away by a high speed diffusion pump system. (M.O.W.)

35613 GLOVE BOX (HA-2 OMB) (Engineering Materials). (Richland Operations Office (AEC), Wash.). (CAPE–1400).

3 drawings.

The glove box, used in working with Pu, is fabricated of 18-8 stainless steel with windows of safety glass. The box is 15 ft 6 in. long, 4 ft 10 in. deep, and 39 in. high. There is a thru conveyor trough under the box constructed of stainless steel. The trough is 11 ft 9 in. long, 18 in. deep, and 13 in. wide. Ports are supplied to service the box and the trough. The box is located on a 36 in. high, 50 in. wide bench constructed of 2 in. stainless steel tubing. (For details, see TID-4100). (F.L.S.)

Heat Transfer and Fluid Flow

See also PHYSICS — Fluid Physics and Thermodynamics

35614 (AEEW-M–452) SPEED OF SOUND IN MIXTURES OF WATER AND STEAM. Davies, A. L. (Atomic Energy Establishment, Winfrith (England)). Oct. 1965. 22p. Dep. mn.

The speed of sound in a homogeneous mixture of water and steam was calculated from the equation, $a = N(dp/dp)$ isentropic, for two different sets of assumptions. In the first case it is assumed that there is no mass transfer between the phases and therefore the water and steam are independently isentropic. In the second case it is assumed that the water and steam are in continuous thermal equilibrium on the saturation line with mass transfer between the phases. It is suggested that in general compression waves propagate according to the first set of assumptions, whereas rarefaction waves propagate according to the second set of assumptions. The effect of various flow regimes and slip on the application of the results to two phase flow is discussed and some other work on the speed of sound is briefly described. Recommendations are made on the application of the results to the propagation of pressure waves and the determination of critical flow in water reactor systems. (auth)

35615 (AEEW-R–468) A COMPARISON BETWEEN BURNOUT DATA FOR 19-ROD CLUSTER TEST SECTIONS COOLED BY FREON-12 AT 155 LB/IN^2(ABS), AND BY WATER AT 1000 LB/IN^2 IN VERTICAL UPFLOW. Stevens, G. F.; Wood, R. W. (Atomic Energy Establishment, Winfrith (England)). Jan. 1966. 61p. Dep. BIS $2.00. HMSO 10s.

Previous experiments on the Winfrith Freon Rig have produced scaling factors which relate these Freon experiments to the corresponding experiments in water with an accuracy of about 10%. It has also been found that the Freon rig is accurate, economical, and easy to use. The scaling factors so obtained have now been tested against data for 19-rod clusters which had previously been tested at Columbia University. The results of the rod cluster tests are presented in which comparison is made between Freon-12 and water for three test-sections which differ in the means of spacing the individual rods. All the test-sections were heated uniformly with respect to length, but had a radial flux depression of nominally 0.70/1.0. The results provide strong evidence that the scaling factor method using Freon-12 at 155 lb/in.^{2} (abs) is a useful technique for predicting the behavior at burnout of complicated test-sections cooled by boiling water at 1000 lb/in.^{2} with only one-eighteenth of the power required for the water experiment. In particular, the Freon tests reproduce closely the relative burnout powers previously measured in water. It has also been found that repeated rebuilding of a nominally unchanged cluster from the same components can produce burnout powers differing by ±6%. This new result illustrates the power and value of the Freon technique. (auth)

35616 (AEEW-R–470) BURNOUT IN CLIMBING-FILM TWO-PHASE FLOW. A REVIEW OF THEORIES OF THE MECHANISM. Kirby, G. J. (Atomic Energy Establishment, Winfrith (England)). Mar. 1966. 63p. Dep. BIS $1.80. HMSO 9s.

Burnout data for annular flow are examined and it is shown that for qualities above 10% the burnout heat flux is a function only of pressure, $D^{\frac{1}{2}}G$ and quality to within the errors in the experimental data. The various burnout models are examined and none are found to predict the

trends given by the above function. The literature on droplet deposition, entrainment and onset of annular flow is studied to see if any new light can be thrown on the problem of burnout. Actual values for the deposition rate of droplets in a boiling channel are derived and it is hoped that these will provide a basis for further studies of possible burnout models. (auth)

35617 (AERE-Bib-150) BIBLIOGRAPHY OF REPORTS ON TWO-PHASE HEAT TRANSFER ISSUED BY A.E.R.E., HARWELL. Cousins, L. B. (Atomic Energy Research Establishment, Harwell (England)). May 1966. 18p. Dep. BIS $0.60, HMSO 3s.

Listings and summaries are presented on the reports and publications issued by the Two-Phase Heat Transfer Section of the Chemical Engineering Division at A.E.R.E., Harwell. The reports are divided into two main sections: burnout and heat transfer studies on steam-water systems and hydrodynamic studies on air-water systems. A list of other relevant reports issued by A.E.R.E. Harwell is given in a supplement. (auth)

35618 (EURAEC-1674) THE STEADY-STATE AND DYNAMIC BEHAVIOR OF A BOILING WATER REACTOR. Quarterly Progress Report No. 20, October 1, 1965–January 1, 1966. (Technische Hogeschool, Eindhoven (Netherlands)). Contract 030-64-1-Teen. 21p. (EUR-2865; WW-016-R94). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Work Performed under United States–Euratom Joint Research and Development Program.

Measurements are described which were carried out using the 60 mm shroud. Results are given for steady state as well as non-steady state conditions and are compared with the results obtained from the 50 mm shroud. The flow-rate tends to be larger and the void fraction to be lower at comparable conditions. The threshold of instabilities has moved to higher power. The effect of subcooling is similar to that observed for the 50 mm shroud. Transfer functions were measured at a saturation temperature of 200°C. Preliminary results of the analysis of the data were reported. The void fraction was plotted according to Zuber and Findlay, the two phase friction data according to Martinelli-Nelson. (auth)

35619 (GEAP-4933) TWO-PHASE FLOW AND HEAT TRANSFER IN MULTIROD GEOMETRIES. Quarterly Progress Report No. 3, April 26, 1965–July 25, 1965. (General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.). Aug. 1965. Contract AT(04-3)-189. 26p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

An instrument is being built for the semi-local measurement of liquid film flow rate. The annular test section is being modified to accommodate an eccentrically positioned rod. A nine-rod test section is being designed with provision to facilitate flow structure measurement. Pressure drop and average test section void data for two-phase upflow of air and water at 100 psia in both the round tube and concentric annulus are in good agreement with the Lockhart-Martinelli correlation. Measurements made with the isokinetic sampling probe for single-phase air and single-phase water are within about 5% of a theoretical curve based upon prediction of inlet pressure drop for laminar flow in the sampling probe. For two-phase flow measurements, a continuous purge will be used in the static pressure lines of the sampling probe setup. A detailed profile investigation of low-quality (6.7%), two-phase flow in a round tube, by means of the sampling probe, showed that the maximum impact pressure does not occur on the tube centerline in spite of the expected smooth distributions of local quality and void fraction across the tube. Thirty-eight critical heat flux data points were obtained bringing the total to 75. The data were obtained using the nine-rod test section with a 60-inch heated length, at test conditions of 1000 psia and 0.5, 0.75, 1.0, and 1.25 M lb/h-ft^2. Qualities at the critical heat flux ranged from 14 to 42%. (auth)

35620 (GEAP-5157) FORCED CONVECTION SUBCOOLED BOILING: PREDICTION OF VAPOR VOLUMETRIC FRACTION. Levy, S. (General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.). Apr. 1966. Contract AT(04-3)-189. 33p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A model is developed to predict the vapor volumetric fraction during forced convection subcooled boiling. The proposed method of calculation consists of three steps: the point of bubble departure from the heated surface (i.e., the location of vapor volumetric fractions significantly higher than zero) is determined from a bubble force balance and the single-phase liquid turbulent temperature distribution away from the heated wall, a relation is postulated between the true local vapor weight fraction and the corresponding thermal equilibrium value, and the vapor volumetric fraction is obtained from the true local vapor weight fraction and an accepted relationship between vapor weight and volumetric fractions. The method was applied to a variety of available test data, and the agreement was satisfactory for a multitude of flow, heat flux, and fluid property conditions. (auth)

35621 (GEAP-5161) TWO-PHASE FLOW AND HEAT TRANSFER IN MULTIROD GEOMETRIES. Sixth Quarterly Progress Report, January 26–April 25, 1966. (General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.). May 1966. Contract AT(04-3)-189. 24p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The flow structure in an eccentric annulus geometry with air and water flowing vertically upward was studied. Data on isokinetic sampling profiles, liquid-film flow rate, pressure drop, and average void fraction were obtained and are presented for one flow condition. Both single-phase air testing and two-phase air-water testing were successfully performed with the nine-rod air-water test section. Initial single-phase test section checkout tests were performed with air at test section pressures of 38 and 80 psig. A total of 370 local velocity measurements were made during single-phase testing. Two-phase testing was conducted at average mass qualities of 21.6 and 38%. Pressure drop data and isokinetic samples were taken at both qualities. Average void fraction, obtained with use of quick-closing valves, was found to be 95.5% at a quality of 38%. An indirect method of determining wall shear in two-phase flow is discussed, and preliminary results are presented. The method is an extension of that proposed by Preston in 1954 for single-phase flow. The method consists of correlating the measured pressure drop with the reading of a small impact tube placed on the tube wall. The preliminary results presented here show this method to be promising; further work is continuing. (auth)

35622 (NYO-2930-7) CONVECTIVE HEAT TRANSFER TO GAS-SOLIDS SUSPENSIONS AT A REYNOLDS NUMBER OF 130,000. Technical Report No. 109-ME-F. Peskin, Richard L.; Briller, Richard (Rutgers–The State Univ. of New Jersey, New Brunswick. Dept. of Mechanical Engineering). May 1966. Contract AT(30-1)-2930. 77p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

An experiment was performed to determine the convective heat transfer coefficient to heated and cooled gas-solids suspensions at a Reynolds number of 130,000. Particle size and solid loading ratio were varied. Measurements of the heat gained or lost by the suspension were made by traversing the stream at various positions with specially designed probes which measured the air temperature and solids temperature locally. The temperature profiles thus measured, along with flow rates of solids and air and the pipe wall temperature determined the heat transfer coefficient. The results showed that for this high a Reynolds number, the heat transfer coefficient for the gas solids suspension appears to equal that of air alone at the same Reynolds number. This effect is independent of solid loading ratio, heating or cooling, and particle size (between .0011″ and .0058″ diameters). (auth)

35623 (TUBIK-1, pp 16-33) WAVY STRUCTURE AND MASS TRANSFER OF THE WAVY FALLING FILM. Malewski, Werner (Technische Universitaet, Berlin (West Germany). Institut fuer Kerntechnik). (In German).

It is shown, how surface ripples and mass transfer in pseudolaminar falling films are correlated. The mass transfer behavior at a wavy surface can be completely de-

scribed, if the wave structure is fully developed. The newly defined quantities, viz., average number of waves per unit of length and mixing intensity, are adequate to characterize the structure of a wavy film. They become additional expressions for the mass transfer equations which are valid for falling films with smooth surface. The calculation of wetted wall columns for mass transfer is described. (auth)

35624 (TUBIK–1, pp 34-72) GEOMETRY, FLOW FRICTION, AND THERMAL INVESTIGATIONS OF WIRE GAUZES. Baumann, K. H.; Blass, E.; Schmidt-Pathmann, W. (Technische Universitaet, Berlin (West Germany). Institut fuer Kerntechnik). (In German).

An investigation of the geometric, flow friction and heat transfer characteristics of wire gauzes is described. Traditional plain wire gauzes of different design, size, and material are tested. Porosity and specific surface are suited for the correlation of flow friction and heat transfer data. Equations or nomograms are developed for the calculation of these parameters from simple geometric informations such as wire diameter, mesh number, and gauze thickness. The flow friction data of wire gauzes in air stream can satisfactorily be represented by physically reasonable equations. Previously published results of thermal investigations are correlated by dimensionless groups. The numerous complications which affect the determination of heat transfer coefficients are submitted. It was found out that especially the complex phenomena of conductivity plays an important role in the overall characteristics and will have to be examined in more detail. (auth)

35625 (WAPD-TM–530) CRIB 1: A STEAM GENERATOR STABILITY ANALYSIS PROGRAM FOR THE PHILCO-2000 COMPUTER. Pulick, M. A.; Margolis, S. G. (Bettis Atomic Power Lab., Pittsburgh, Pa.). Dec, 1965. Contract AT(11-1)-Gen-14. 100p. Dep. mn, CFSTI $3.00 cy, $0.75 mn.

An analysis for a digital computer program to predict the steady-state recirculation ratio and the presence of hydrodynamic instabilities in a steam generator is presented. The salient features for this analysis are as follows: allows for variable flow area and flow direction, allows for two-phase flow phenomena by employing a Martinelli-Nelson slip model, allows for a variable water level, and allows for a detailed account of mass and energy transport in the downcomer, tube bundle, and riser region. A single sample problem for comparison between analysis and experiment is also presented. The sample problem is for a natural circulation test loop, for which published data were readily available. Although the loop geometry is simple, its configuration and operating conditions were similar to those normally encountered on the secondary side of a steam generator. As indicated by the results the agreement between the predicted and experimental results is good. Experience to date is insufficient to determine whether this type of agreement can be expected for other geometries and other operating conditions. The comparison does demonstrate, however, that the analysis is capable of predicting the steady-state recirculation ratio and the presence of hydrodynamic instabilities. (auth)

35626 (WAPD-TM–545) TOPS: A FORTRAN PROGRAM FOR THE TRANSIENT THERMODYNAMICS OF PRESSURIZERS. Redfield, J. A.; Margolis, S. G. (Bettis Atomic Power Lab., Pittsburgh, Pa.). Dec. 1965. Contract AT(11-1)-Gen-14. 38p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The TOPS program is a digital simulation of pressurizer dynamics based on a rigorous application of the first law of thermodynamics and phenomenological heat and mass transfer laws with empirically determined coefficients, which is an extension of the initial model development done with analog computer studies. The program is useful in studying the thermodynamic paths of pressurizer transients, and is convenient to use as a design tool. A comparison with experimental data is included in order to demonstrate the validity of this analysis method. In the TOPS representation of the pressurizer, no a priori assumptions are made concerning the particular thermodynamic process followed during insurge or outsurges. This contrasts with most currently used models, in which some predetermined process (isentropic compression, saturation line, etc.) is built into the model. In the representation used here, the program itself determines the thermodynamic process at each instant of the transient. In addition it is possible to simulate the special cases of isentropic and saturation line paths by appropriate selection of the heat and mass transfer coefficients. The pressurizer equations are developed in detail for the simplified geometric representation of the pressurizer, the numerical methods are presented, the selection of heat and mass transfer coefficients is determined, and a comparison with experiments is discussed. (auth)

35627 (AEC-tr–6737) INTENSIFICATION OF HEAT EXCHANGE IN EVAPORATORS. Chernozubov, V. B.; Bolotov, A. A.; Golub, S. I.; Chadov, V. N.; Zaostrovskii, F. P.; Chemezov, V. A.; Minukhin, L. A.; Mrezhin, L. S. Translated from Paper No. SWD/62 Presented at the First International Symposium on Water Desalination, October 3-9, 1965, Washington, D. C. 23p. (CONF-651005–12). Dep. mn. CFSTI $1.00 cy, $0.50 mn. JCL $2.60 fs, $0.89 mf.

A study of heat exchange intensification is presented. The study considered the following approaches: the removal of the harmful influence of noncondensible gas admixtures in the heating steam on the heat transfer coefficient during condensation, ensuring droplet vapor condensation on the heating surfaces, and the development of sufficiently economical methods for an increase in heat transfer coefficient of heat generation by the liquid in heat exchange devices. (B.G.D.)

35628 STUDY OF THE DYNAMICS OF A HETEROGENEOUS FLUIDIZED BED. I. APPLICATION OF GAMMA RADIATION IN STUDYING THE FLUIDIZATION PROCESS. Janio, K. (Polytechnic Inst., Lodz, Poland). Int. Chem. Eng., 6: 303-7 (Apr. 1966).

The degree of heterogeneity of a fluidized bed was determined by measurement of the weakening of the intensity of γ radiation during its passage through the bed. After derivation of pertinent mathematical relations, experiments were conducted with an apparatus that is shown schematically. A ^{60}Co source in a lead shield and a radiation detector equipped with an electronic recording apparatus at the same level were placed on the inside walls of a glass tube constituting the fluidization column. The isotope-detector system was fastened on a lever which permitted vertical movement along the axis of the apparatus. The distance between the radiation source and detector was always identical during the experiments. The fluidizing agent was air fed by a blower through a metering reducer to the fluidized bed apparatus. Measurements were made in a glass tube, with a dia of 75 mm and a height of 1200 mm, with three fractions of sand. Some fluidization properties of these fractions are given. Curves showing distribution of the relative density (ρ) of the fluidized phase $\rho/\rho_t = f(x)$, indicated that a heterogeneous fluidized phase can be divided into three main portions: the dense phase, the transition phase, and the dispersed phase. (TCO)

35629 ANALYTICAL STUDY OF HEAT TRANSFER TO LIQUID METALS FLOWING IN-LINE THROUGH CLOSELY PACKED ROD BUNDLES. Dwyer, O. E. Nucl. Sci. Eng., 25: 343-58(1966). (BNL–9143).

Circumferential variations of temperature and local heat transfer coefficients were obtained for sodium flowing in-line through a staggered rod bundle. The conditions of the study were: turbulent flow, uniform heat flux from the surfaces of all rods, and fully developed velocity and temperature profiles. The rods were spaced in an equilateral triangular array, and the pitch:diameter (P:D) ratio was varied down to 1.10. It was shown that the annulus model is satisfactory for estimating average heat transfer coefficients for P:D ratios down to about 1.3, but below this, it gives increasingly high results, e.g., at P:D = 1.10, an annulus-model coefficient can be high by about a factor of 2. It was found that circumferential temperature

variations are not large, e.g., at P:D = 1.10, this variation is about twice the average temperature drop from the rod surface to flowing metal. Compared to the P:D ratio, the Peclet number has little influence on the reduction in the average heat transfer coefficient, or the circumferential variation of the surface temperature. At a P:D ratio of 1.40, the local coefficient is estimated to vary by a factor of only 1.2; at 1.20, by a factor of 1.7; and at 1.10, by a factor of ≈100. (auth)

35630 GENERALIZED EXPERIMENTAL DATA ON HEAT TRANSFER IN SUBCOOLED BUBBLE BOILING IN PIPES. Pokhvalov, Yu. E.; Kronin, I. V.; Kurganov, I. V. (Moscow Engineering-Physics Inst.). Teploenergetika, No. 5, 63-8(May 1966). (In Russian).

By the methods of dimensional analysis a general relation is derived for a group of thermodynamically similar substances which gives the heat exchange of subcooled liquids in tubes. The proposed formula is the following: $\Delta t_0 = 7\ T_{crit.}^{0.82}\ M^{0.18}\ p_{crit.}^{-0.36}\ \Delta q^{0.36} \exp(-5.6\ T_{sat.}/T_{crit.})$. Here Δt is the wall superheat with $\Delta t = t_{wall} - t_{sat.}$, where t_{wall} is the temperature of the wall, and $t_{sat.}$ is the saturation temperature. $T_{crit.}$ and $p_{crit.}$ are the critical temperature and pressure in °K and n/m². M is the molecular weight of the medium. Δq is the net heat flux in watts/m². This formula can be used to calculate heat exchange in tubes and in a large volume of solution. It is simple and does not require knowledge of physical parameters over a wide temperature interval. (TTT)

35631 TEMPERATURE DISTRIBUTION AND EFFICIENCY OF RADIATION CONVECTION FINS WITH INTERNAL HEATING. REPORT 3. CHARACTERISTICS OF GROUPED FINS(1). Okamoto, Yoshizo (Japan Atomic Energy Research Inst., Tokyo). Trans. Jap. Soc. Mech. Eng., 31: 964-74(June 1965). (In Japanese).

An analysis was made of temperature distribution and fin efficiency in the case where a fin plate group consisting of many fin plates with internal heating radiated heat from the surface with convection. A numerical calculation method was obtained for the total ratio of incoming radiation with respect to a fin plate section, considering the mutual interference of radiations among the plates limiting the sections. From this, the ratios of incoming radiation were obtained and the solutions of the temperature distribution and fin efficiency were given by the use of a digital computer. From an analysis of a convection fin plate group having interference between the radiator surfaces, it was found that as the radiation dimensionless value L increased, the temperature distribution became more uniform by the intensified interference between the radiator surfaces. From an analysis of a gas radiation fin plate group, it was also found that the temperature distribution was remarkably uniform as compared with the case of a single gas-radiation fin-plate. (NSA of Japan)

35632 TEMPERATURE DISTRIBUTION AND EFFICIENCY OF RADIATION CONVECTION FINS WITH INTERNAL HEATING. REPORT 4. CHARACTERISTICS OF GROUPED FINS(2). Okamoto, Yoshizo (Japan Atomic Energy Research Inst., Tokyo). Trans. Jap. Soc. Mech. Eng., 31: 975-83(June 1965). (In Japanese).

In the previous paper, the phenomena of thermal radiation were classified into five forms, and the characteristics of the first two, viz., (1) convection fin plate group and (2) gas radiation fin plate group, were analyzed. The remaining three forms, that is, (3) convection gas radiation fin plate group, (4) heat-receiving surface radiation fin plate group, and (5) gas, heat-receiving surface radiation fin plate group, were analyzed and the fin efficiency, thermal conduction ratio, and heat flow were calculated for each form, using a digital computer. For the heat-receiving surface radiation fin plate group, it was found that the larger the fin pitch p and the passage length L (dimensionless value), the more the fin efficiency increased. When the value of L exceeded 10, the temperature distribution and the fin efficiency became nearly constant, and the heat flux was not decreased by the interference between the fin surfaces but was mainly subject to the radiation heat transfer from the fin surfaces. In the heat-receiving surface radiation fin plate group, the radiation heat fin efficiency increased with p, L, and e (emissivity). (NSA of Japan)

Materials Testing

35633 (NP-16149) THE NONDESTRUCTIVE TESTING OF FUEL ELEMENTS BY MEANS OF COMPTON RECOIL SPECTROMETRY. Final Report. (Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf, Physik-Institut). Dec. 1964. 38p. Dep. mn.

For nondestructive routine determination of nuclear fuel burnup a high resolution Compton γ spectrometer using a semiconductor detector was developed. The method is based on a measurement of the intensity of the ^{137}Cs 661-kev γ line, which is hidden in the complex fission product spectrum. Because of the long half life (30 y) the information obtained is independent of a knowledge of irradiation history within usual reactor operation times. The equipment developed is transportable, the spectrometer itself has a size of only 40 × 40 × 20 cm. In routine operation a resolution of 13–15 kev (fwhm) was obtained. The method was shown to be reliable within 15% (standard deviation) or even less. A measurement of one fuel element takes typically 20 minutes. (auth)

35634 USE OF A POLLAK COUNTER FOR IN SITU TESTING OF HIGH-EFFICIENCY FILTERS. Davis, R. E.; Clifton, J. J. (United Kingdom Atomic Energy Authority, Dorset, Eng.). Health Phys., 12: 981(July 1966).

A method for the in-place testing of high-efficiency filters is described. A Pollak condensation nucleus counter is used to measure the concentration of ambient radon decay products attached to condensation nuclei in the gas both upstream and downstream of the filters. The condensation nuclei either occur naturally or can easily be generated using a coal gas flame. The nuclei are detected in the counter by causing a fog to form on them and measuring the fog density using a beam of light and a photocell. The Pollak counter is small, portable, simple to operate, and relatively cheap. (C.H.)

Space Propulsion

See also ISOTOPE TECHNOLOGY — Power Application
REACTOR TECHNOLOGY — Propulsion and Space

35635 (NP-16213) OPTIMIZATION OF THE THERMAL EFFICIENCY OF THE MAGNETIC ANNULAR ARC. Schneiderman, A. M.; Patrick, R. M. (Avco-Everett Research Lab., Everett, Mass.). Mar. 1966. Contract NAS-3-5748. 20p.

The magnetic annular arc (MAARC) is an axisymmetric Hall current plasma accelerator. Effort has been directed in the MAARC and other similar MPD arc propulsion devices toward maximization of overall propulsive efficiency (ratio of thrust power to total electrical input power) in the specific impulse range 3000 to 5000 sec. A parametric study of the thermal efficiency, i.e., the ratio of propellant power to electric input power is presented. Previous work has shown that the overall voltage of the MAARC is described by the relation $V = V_0 + U_c Bl$, where V_0 is an integration constant, U_c the velocity a particle has when its kinetic energy equals the energy required to ionize and dissociate it, and l a characteristic length. It is shown that anode heat transfer is related to the constant V_0, and thermal efficiency increases with the ratio $U_c Bl/V_0$. It is also shown that mode changes observed by several investigators of MAARC type devices manifest themselves as changes in V_0. Data are presented which indicate that these mode

changes can be controlled by variation of the cathode location. (auth)

Vacuum Engineering

35636 MEASUREMENT OF TOTAL AND PARTIAL PRESSURES BETWEEN 10^{-10} AND 10^{-12} TORR. Hoch, H. Vide, 21: 221-6(May-June 1966). (In French).

Measurements of final partial pressures were made above different pumping systems. The vacuum pumps used had a suction speed of 40 to 500 l/s. The measurements were taken with several pressure gages incorporating cold or warm cathodes. The modification of the residual analysis, when total pressure measuring systems are switched on, was controlled with the omegatron. The results are discussed. (auth)

35637 AXIAL INFLOW TURBOMOLECULAR PUMP OF HIGH CAPACITY. Rubet, L. Vide, 21: 227-34(May-June 1966). (In French).

The working process of an axial inflow turbomolecular pump is briefly described. Performances obtained with a high-capacity machine, i.e., ~9,000 l/s for a range of pressures down to 1×10^{-9} torr are described. The lowest pressure reached during the tests performed was 1.4×10^{-11} torr but this should not be considered as a limit since a pressure lower than 5×10^{-11} torr was kept, even with a rotation speed lower than half its normal value. (auth)

35638 AIR-TIGHT JOINTS WITH GOLD WIRES FOR ULTRA-HIGH VACUUM. Souchet, R. (CERN, Geneva). Vide, 21: 235-9(May-June 1966). (In French).

The construction of an ultrahigh vacuum chamber and the choice of the sealing connections are discussed. The parameters that influence the choice of a connection are variable, according to the requirements. The use of a gold wire gave very good results; it is an economic method since the gold wire is recovered after use at the present market value. After the necessary stock is bought, the only additional cost is the cost of spinning the gold wire. Because the deformation load is relatively small, the method is reproducible and guarantable. The addition of the centering ring, which positions the flanges, is a characteristic that makes this type of sealing connection usable in all cases. (auth)

35639 VACUUM ION GAUGE AND CONTROLLER /Q-2572/ (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-1392).

2 drawings.

A cold-cathode ion gage is designed for use as a vacuum indicator and controller. The instrument, which is simple, reliable, and accurate, is very stable during line voltage variation. The gage is calibrated in three ranges covering 10^{-3} to 10^{-6} torr. An indication can be obtained from 2.5×10^{-3} to 1×10^{-7} torr. The instrument consists of a regulating transformer, half-wave rectifier, alarm circuits, and a meter controller module. (For details, see TID-4100.) (TCO)

GEOLOGY, METEOROLOGY, AND MINERALOGY

General

Refer also to abstract 36386.

35640 (LA–3520) THE CURRENT STATUS OF ARCHEOLOGY AT THE NEVADA TEST SITE AND THE NUCLEAR ROCKET DEVELOPMENT STATION. Worman, F. C. V. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). May 1966. Contract W-7405-eng-36. 30p. Dep. mn, CFSTI $2.00 cy, $0.50 mn.

The Nevada Test Site and Nuclear Rocket Development Station are categorized by areas of archeological interest. Treatment of the various areas to comply with the directive regarding protection and preservation of antiquities on AEC-owned or controlled property is discussed. (auth)

Meteorology

See also Site Survey and Selection

35641 SELF-SCAVENGING OF THE LOWER TROPOSPHERE FROM RADIOACTIVE DUST (REVIEW). Makhon'ko, K. P. Fiz. Atmos. Okeana, 2: 508-22(May 1966). (In Russian).

A review is presented on the removal of radioactive dust from the lower troposphere by dry deposition and atmospheric precipitation. (58 references) (auth)

35642 GENERAL CIRCULATION OF THE ATMOSPHERE AND ITS EFFECTS ON THE MOVEMENT OF TRACE SUBSTANCES. PART 2. Newell, Reginald E.; Wallace, J. Michael; Mahoney, James R. (Massachusetts Inst. of Tech., Cambridge). Tellus, 18: 1-18(1966). (MIT–2241-23).

The assumption is made that the large-scale mixing properties of the atomosphere are related to the time and spatial variances of the winds. Data on the time standard deviations are presented for levels from the surface to about 75 km based on balloon and rocket soundings. The monthly and year to year variations in the 15–30 km region and the average seasonal variation for the 30–75 km region are examined. An attempt to relate the time and space distributions of some radioactive and airglow tracers to the wind data is made. (auth)

Natural Radioactivity and Fallout

See also HEALTH AND SAFETY

35643 (CEX–61.7.2) AERORADIOACTIVITY SURVEY AND GEOLOGY OF PUERTO RICO (ARMS-I). MacKallor, Jules A. (Geological Survey, Washington, D. C. Division of Biology and Medicine (AEC), Washington, D. C.). Mar. 1964. 24p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

An aeroradioactivity survey of Puerto Rico was made with scintillation-detection equipment installed in a twin-engine aircraft. The island was traversed on east-west flight lines spaced approximately one mile apart, and the aircraft maintained an altitude of 500 ft above ground. The radioactivity data were corrected for deviations from the surveying altitude and a cosmic component was subtracted. Radioactivity of most of the central part of the island is 200 to 300 cps, and an area several miles wide that extends southeastward for twenty-five miles from San Sebastian is 300 to 800 cps. Radioactivity of the outer margins of the island is mostly 100 to 200 cps, with small areas of considerably higher radioactivity. (J.R.D.)

35644 MEASUREMENT OF THE RADIOACTIVITY OF THE MEUSE WATERS AND OF THE FALLOUT IN BELGIUM DURING THE YEAR 1965. Gerardy, J.; Govaerts, J.; Guillaume, M.; Walch, N. Bull. Soc. Roy. Sci. Liege, 35: No. 1-2, 106-9(1966). (In French).

The results obtained during 1965 for the determination of ^{90}Sr and ^{137}Cs in samples of Meuse waters and in fallout in Belgium are reported. The fallout data were compared to those of the two preceding years. (tr-auth)

35645 GEOCHEMICAL COINCIDENCE BETWEEN STRONTIUM ISOTOPES AND LEAD ISOTOPES. Masuda, Akimasa (Tokyo Univ.). Chem. Geol., 1: 57-60(Mar. 1966).

The extent of fractional crystallization, which is assumed to have given rise to the source material of common leads at the time of primeval differentiation of the earth, covers the range of the $^{87}Sr/^{86}Sr$ ratio found in basalts. The concentrations of minor elements in basic rocks are determined largely by the concentrations of the relevant elements in the earth's initial oxide material, their partition coefficients, the genetic type, and the liquid-fraction value. The liquid-fraction value for the original source material for common leads varies from 1/6.3 to 1/36, averaging 1/17. The $^{87}Sr/^{86}Sr$ ratios corresponding to these liquid-fraction values were evaluated and the resultant values of the ratio compared with the directly observed ones. Agreement between the calculated variation range and the actual one is good. The calculated mean value, 0.7075, for $^{87}Sr/^{86}Sr$ is close to the average for the observed values; it ranks intermediate between the average for oceanic basalts of 0.7072 and the average for continental basalts of 0.7082. (TCO)

35646 COSMIC ORIGIN OF SEASONAL MAXIMUM OF MAGNETIC FALLOUT. Grjebine, Tovy; Lambert, Gerard; Labeyrie, Jacques (CEN, Gif-sur-Yvette, France). Compt. Rend., Ser. B, 262: 1578-81(June 13, 1966). (In French).

The observation in the northern hemisphere at the beginning of the year of a simultaneous maximum of the magnetic and radioactive fallout shows their stratospheric origin. A second maximum of the magnetic fallout, free from artificial radioactivity, in September observed all over the earth is attributed to cosmic dust of higher particulate size distribution. (tr-auth)

35647 PRIMARY RESULTS ON THE TRITIUM CONTENT OF THE WATERS OF LAKE LEMAN. Blavoux, Bernard; Olive, Philippe (Faculte des Sciences, Paris). Compt. Rend., Ser. D, 262: 2445-8(June 13, 1966). (In French).

Results from a systematic study of the tritium activity of Lake Leman showed an increase of the mean activity in 1965, a decrease in tritium concentrations from the surface toward the bottom, and a seasonal evolution of different layers. (tr-auth)

35648 REPORT ON A RADIATION SURVEY MADE IN EGYPT, INDIA, AND CEYLON IN JANUARY 1963. Patterson, H. Wade; Wallace, Roger (Univ. of California, Berkeley). Health Phys., 12: 935-41(July 1966). (UCRL-10851; UCRL–10851(Rev.)).

A radiation survey has been made in three monazite sand areas in Africa and southern Asia, with sodium iodide detectors, which were designed to eliminate to a large extent the effect of cosmic rays and to emphasize the γ rays of the natural environment. The first survey was made in Egypt, from 29 December 1962 through 1 January 1963. A second survey was made in the states of Kerala and Madras in south India, along the beaches both north and south of the city of Trivandrum, from 10 January through 13 January 1963. The third survey was carried out in southwestern Ceylon, north and south of the city of Colombo, from 15 January through 21 January 1963. Results are presented from physical measurements made during these three surveys, and the dose levels that were instantaneously present in these areas are evaluated. (C.H.)

35649 NATURE OF RADIOMETRIC ANOMALIES ABOVE OIL AND GAS DEPOSITS. Gottikh, R. P. Int. Geol. Rev., 8: 144-53(Feb. 1966).

Negative anomalies in the γ field over accumulations of hydrocarbons are explained by weakening of the adsorption capacities of rocks under the influence of certain hydrocarbons. The peak quantity of uranium is contained in clays and often in calcareous sediments; sandstones and siltstones stones are much poorer in this element. In deep weathering of rocks which is the source of radioactive elements the mobility of thorium is increased and it migrates into the more remote parts of the sedimentation basin. The potassium (^{40}K) concentration is also differentiated according to type of sediment, since it is a component of clay minerals. In the Korobkovo oil and gas deposits, low values of the field above the oil deposit correspond to the arch of the structure and to the area containing Neocomian sands and sandstones. A narrow belt of high values of the γ field coincides with outcrops of clay deposits of the Aptian stage, while Albian sands are characterized by low values of the γ field. The radiometric anomalies in the overburden are accompanied by abnormally low contents of potassium, uranium, radium, and some other elements stable in their dispersed state. The γ field regional background depends mainly or entirely on the geochemistry of superficially abundant materials. (TCO)

35650 OXYGEN AND CARBON ISOTOPIC FRACTIONATION BETWEEN COEXISTING METAMORPHIC CALCITE AND DOLOMITE. Schwarcz, H. P. (McMaster Univ., Hamilton, Ont.). J. Geol., 74: 38-48(Jan. 1966).

Theoretical basis for and technics of fractionation of $^{18}O/^{16}O$ and $^{13}C/^{12}C$ ratios are presented, and determinations were made for 11 specimens of coexistent dolomite and calcite from rocks of a variety of metamorphic grade in Vermont. For hydrothermal and metamorphic assemblages there should be a temperature-dependent variation in the equilibrium constant, $K^{18}_{DC} = r^{18}_{O}$ (D)/r^{18}_{O} (C), where r^{18}_{O} (D) and r^{18}_{O} (C) are the $^{18}O/^{16}O$ ratios of dolomite and calcite, respectively, at equilibrium. Oxygen-isotope fractionations between coexisting metamorphosed dolomites and calcites appeared to differ from zero and in some cases to be of the order of magnitude of those expected from experimental determinations of the variation in K^{18}_{DC} with temperature. The fractionation α^{18}_{DC} appeared to decrease erratically with metamorphic grade, but several specimens gave apparent temperatures which are unreasonably high or low for the metamorphic grade inferred on petrologic grounds. Furthermore, α^{18}_{DC} did not appear to correlate with the magnesium content of the calcite, presumably a measure of the temperature of last recrystallization of the dolomite and calcite. Carbon-isotope fractions α^{13}_{DC}, on the other hand, did not correlate with the grade of metamorphism but did correlate strongly with the Mg content of the calcite. (BBB)

35651 TOTAL POTASSIUM IN SOILS BY RADIOACTIVITY MEASUREMENTS. Talibudeen, O.; Yamada, Y. (Rothamsted Experimental Station, Harpenden, Eng.). J. Soil Sci., 17: 107-20(1966).

The natural radioactivity in 19 British soils was studied, particularly that from ^{40}K. It was shown that the principal β emitters in soil are ^{14}C, ^{40}K, ^{87}Rb, ^{232}Th and its daughter elements, and ^{238}U and its daughter elements. The half-thicknesses of self-absorption for all β radiations from these elements are calculated from the relation $d_{\frac{1}{2}} = 32E^{1.33}_{max}$ and $g_{\frac{1}{2}} = 2.3d_{\frac{1}{2}}$, where $d_{\frac{1}{2}}$ and $g_{\frac{1}{2}}$ are the half-thicknesses in mg cm^{-2} for external and self-absorption and E_{max} in Mev is the max β energy. These range from 0.2 to 3.54 mg cm^{-2} for natural radionuclides in the soil and necessitate corrections for the apparent density of the experimental material during β-radioactivity assay. Also calculated was the contribution of α, β, and γ emissions from K and from uranium and thorium families to the natural radioactivity of soils, based on their chemical composition. In general the β assay method for K content is cumbersome and inaccurate; however, it is relatively inexpensive and simple. With similar soils containing the same proportions of radionuclides from the U and Th families, it gives K contents agreeing with those determined by chemical methods. The β and γ analysis methods were compared on 19 British soils; marker γ photopeaks of daughter elements were used for estimating Th and U, and the 1.46-Mev ^{40}K photopeak for K. (TCO)

35652 SOME PROPERTIES OF NATURALLY OCCURING RADIATIONS AND RADIOACTIVE IONS IN THE ATMOSPHERE. Kawano, Minoru; Ikebe, Yukimasa; Nakashima, Yoshiyuki; Shimizu, Kuniyasu (Nagoya Univ., Japan). Mem. Fac. Eng., Nagoya Univ., 17: 125-59(Nov. 1965).

The ionizations by alpha, beta, and gamma radiations from the atmosphere and the ground are considered. The specially designed ionization chamber and the plastic wall ionization chamber are used for measuring the rate of ion pair production by beta and gamma radiations, respectively. The charcoal trapping method is used for measuring the rate of ion pair production by alpha radiation. The survey was carried out at 32 points in and around Nagoya City. Beta radiation contributes the most for ionization of the air near the ground, and gamma radiation including cosmic radiation is next. The rate of ion pair production due to the alpha radiation in the atmosphere is almost 1 J on the average. The contribution of low-energy radiation, below 40 kev, to the ionization of the air close to the ground is almost the same as that of alpha radiation. The properties of the radioactive ions are also considered. The energy spectra of alpha particles from the radioactive ions in the three ranges of critical mobility were measured. The results showed that radioactive ions with critical mobilities of 4.4 cm^2/sec and 0.7 cm^2/sec v carry only ^{218}Po, and those with a critical mobility of 0.2 cm^2/sec v carry not only ^{218}Po but also ^{214}Pb and ^{214}Bi. The results of simultaneous measurements showed that the radioactive ions with a critical mobility of 4.4 cm^2/sec v only are free from any kind of condensation nuclei. The mean life of radioactive ions in the range described above is 23 sec on the mountain top, and 1.3 sec on the campus inside a big city. (auth)

35653 TRANSFER OF NORTHERN HEMISPHERE FALLOUT TO THE SOUTHERN HEMISPHERE. Woodward, R. N. (Inst. of Nuclear Sciences, Lower Hutt, New Zeal.). Nature, 210: 1244-5(June 18, 1966).

Detection of ^{140}Ba in rainwater samples in New Zealand was related chronologically from 1962 to 1965 with low-yield nuclear explosions from the Northern Hemisphere. An increase in ^{90}Sr deposition was most likely from the last major series of Soviet tests in 1962, but the method of movement could not be determined from available data. Movement of nuclear debris was studied at very high altitudes by a device detonated 400 km above Johnston Island (17°N, 169°W) labeled with ^{109}Cd. This isotope was detected 14 months later in New Zealand rainwater but may have been present in earlier samples. (P.C.S.)

Techniques and Equipment

35654 (CEA-R-2919) ETUDES SUR LA METHODE GAMMA-GAMMA. DETERMINATION D'UN APPAREILLAGE POUR LA MESURE EN PLACE DE LA DENSITE DES MINERAIS D'URANIUM. (Studies on the Gamma-Gamma Method. Development of an Apparatus for On-The-Spot Measurement of Uranium Ore Densities). Czubek, Jan A.; Guitton, Jean (Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires). Apr. 1966. 72p. Dep. mn.

Experimental results obtained on graphite using the gamma-gamma probe are presented along with data for calibration curves. Parameters of scattered radiation energy spectra and calibration curves were studied along with radioactive sources, probe areas, source-detector distances, and shielding. Mathematical models of calibration curves were developed and optimization of the probe was achieved. (J.R.D.)

35655 PRESENT STATE AND USE OF BASIC NUCLEAR GEOPHYSICAL METHODS FOR INVESTIGATING ROCKS AND ORES. Berzin, A. K.; Bespalov, D. F.; Zaporozhets, V. M.; Kantor, S. A.; Leipunskaya, D. I.;

Sulin, V. V.; Feldman, I. I.; Shimelevich, Yu. S. (Inst. of the State Geological Committee, Moscow). At. Energy Rev., 4: No. 2, 59-111(1966).

Standard radioisotope sources are very widely used in nuclear-geophysical practice to log oil, gas, coal, and ore boreholes. Logging data serve for the lithological differentiation and correlation of the geological sections of boreholes, for determining the thickness of productive strata, the position of water-oil and gas-liquid contacts, porosity, degree of oil-gas saturation and presence of coal in the rock, and for the quantitative and qualitative assessment of the content of various industrially valuable elements in the strata. Radioisotope sources are also successfully used in various nuclear-geophysical methods of elemental analysis of rock and ore samples, both in laboratory and in field conditions. In recent years nuclear geophysics made wider use of nuclear reactors, sub-critical reactors, and neutron and gamma generators. The potentialities of radioactive logging were considerably extended by the development of steady-state and pulsed neutron generators specifically intended for nuclear-geophysical borehole work. Particular attention was paid to the development and industrial application of highly effective pulsed-neutron methods of investigating boreholes. In particular, the use of these methods to determine the position of water-oil and gas-liquid contacts proved two to three times more effective than the standard methods based on the use of radioisotope neutron sources. A promising approach is the use of new methods of activation analysis of rocks and ore samples involving fast neutron generators and betatrons. This is beginning to eliminate the long-standing shortcomings in the analysis of samples for light elements, and also fulfils important prerequisites for the nondestructive multicomponent analysis of samples. (auth)

35656 A NEW INTERPRETATION OF A RADIOACTIVE TRACER EXPERIMENT IN THE TIMAVO RIVER. Mosetti, F. (Osservatorio Geofisico Sperimentale, Trieste, Italy). Boll. Geofis. Teor. Appl., 7: 218-43 (Sept. 1965). (In Italian).

Use of ^3H_2O in hydrological experiments is considered from a theoretical viewpoint and mathematical expressions are derived for use to ^3H_2O in the study of water courses. Experiments were conducted by injecting 200 C of ^3H_2O into the upper Timavo River to trace the water flow of the lower Timavo (mean daily flow 1,500,000 m^3) and of other minor sources, as well as to estimate the amount of the external contributions. Quantitative determinations were carried out from the concentration curve c(t) of the tracer. This is an asymmetric curve (like an error curve) with a maximum at time t_m, x is the distance between injection point and testing point, and the average travelling velocity is X/t_m. The tracer density $q = Q/S$ is the ratio between the injected quantity Q and the section S at the injection point, or also the ratio between the quantity Q which flows through a given point and the corresponding section. The quantity $Q' \leq Q$ can be determined, if the water flow P' is known, from $Q' = P' \int_0^\infty c(t)dt$. The amount of the water contribution may be obtained from the areal ratio of the concentration curve in the different points. Analysis of the curve allows calculation of the dispersion constant, D, from which another characteristic parameter, the so-called mixing length, L, can be defined. L is low if the river flows with high velocity and turbulence, and small if the velocity is low or in case of filtering of the water. The results obtained in this way indicated that only part of the water in the Upper Timavo flowed through the tested sources near the coast, where the labeled water was mixed with other water of different origins. (BBB)

35657 STUDIES OF PRODUCING RESERVOIRS WITH THE NEUTRON LIFETIME LOG. Marquis, G. L.; Wichmann, P. A.; Millis, C. W. (Lane-Wells Co., Houston, Tex.). J. Petrol. Technol., 18: 412-18(Apr. 1966).

The neutron lifetime log uses a pulsed accelerator neutron source to measure thermal neutron capture cross-section to determine water saturation. Measurements can be applied to full scale reservoir studies, either as a complement to openhole logging data or as a method of continually updating various reservoir parameters such as fluid contacts. Theoretical and practical aspects of thermal neutron capture cross-sections are discussed in relation to this application. In the operation of the neutron lifetime logging instrument, pulses of $\sim 10^5$, 14-Mev neutrons are produced over about a 30-μsec period once every 1000 μsec. These neutrons are very quickly slowed to the thermal energy level as they continue their path radially away from the source, and are then captured by individual nuclides at a rate determined by the capture cross-section of the medium in which they are traveling. Examples of successful log interpretation of consolidated sandstone and limestone are given. Its use in identifying gas-oil and oil-water contacts is verified. (TCO)

35658 STATISTICAL TEST CALCULATIONS FOR ROCK STUDIES BY PULSED NEUTRON-NEUTRON METHODS. Rezvanov, R. A. Prikl. Geofiz., Vses. Nauch.-Issled. Inst. Geofiz. Metod. Razvedki, Sb. Statei, No. 39, 136-52(1964). (In Russian).

The Monte Carlo method was used to calculate the space-time distribution of neutrons in a homogeneous sandstone with porosities of 0, 5, 10, and 20%. Calculations were also carried out for a sandstone saturated with water at porosities of 5, 10, and 20%, and in a sandstone saturated with brine containing 200 g/l of NaCl at porosities of 10 and 20%. A neutron with an initial energy of 2.45 Mev was followed to a final energy of 0.1 ev. The thermal neutron distribution (time for the occurrence of a neutron maximum, drop in neutron density, etc.) could be used to estimate the hydrogen and chlorine contents of strata. It was possible to distinguish between water-bearing and oil-bearing strata. (TTT)

35659 DETECTION OF UNDERGROUND EXPLOSIONS. Bullard, Edward. Sci. Amer., 215: 19-29(July 1966).

Seismology as it relates to the detection of tests of nuclear weapons below the surface of the earth is discussed. The detection of such tests has three aspects: detection, location, and identification. Reduction of background seismic noise is discussed. Instrumentation is described. Methods of distinguishing a nuclear explosion from an earthquake are considered. (M.C.G.)

Thorium and Uranium Minerals

35660 COCONINOITE, A NEW URANIUM MINERAL FROM UTAH AND ARIZONA. Young, E. J.; Weeks, A. D.; Meyrowitz, Robert (Geological Survey, Denver, Geological Survey, Washington, D. C.). Amer. Mineral., 51: 651-63(May-June 1966).

Coconinoite, named for Coconino County, Arizona, is a uranium mineral with the probable formula $Fe_2Al_2(UO_2)_2(PO_4)_4(SO_4)(OH)_2 \cdot 20\ H_2O$. It was found in the oxidized zone of uranium deposits in Utah and Arizona and occurrences were documented from Wyoming, New Hampshire, and from two unknown localities. Coconinoite is light creamy yellow, nonfluorescent, and soft. It forms aggregates of microcrystalline lathlike to platy grains, which have a maximum observed length of 20 microns. Measured specific gravity is 2.70 and specific gravity calculated from the Gladstone and Dale rule is 2.68. It is biaxial (–) with $\alpha = 1.550 \pm 0.005$, $\beta = 1.588 \pm 0.005$, $\gamma = 1.590 \pm 0.005$, 2V about 40°; the pleochroism is α = colorless, $\beta = \gamma$ = pale yellow. Although the mineral is too fine grained for single-crystal x ray study, monoclinic symmetry is suggested by extinction angles. The d-spacings of the strongest lines are 11.05 Å (VVS), 5.52(S), 3.28(M), 3.67(M), and 5.61(M). The formula is based on microchemical analyses of samples from Utah and Arizona. The sample from the Blackwater No. 4 Mine, Apache County, Arizona, contained (in weight per cent) $Fe_2O_3 = 9.7$, $Al_2O_3 = 6.6$, $UO_3 = 34.9$, $P_2O_5 = 18.3$, $SO_3 = 5.4$, $H_2O- = 18.2$, $H_2O+ = 5.8$, acid insol. = 0.5, CaO = 0.1, $CO_2 = <0.1$, $Na_2O = <0.1$, Total = 99.5. The sample from the Jomac Mine, White Canyon, San Juan County, Utah, contained (in weight per cent) $Fe_2O_3 = 10.3$, $Al_2O_3 = 6.5$, $UO_3 = 34.2$, $P_2O_5 = 17.7$, $SO_3 = 6.1$, $H_2O- = 18.8$, $H_2O+ =$

4.6, acid insol. = 1.0, CaO = <0.1, CO_2 = 0.7, Na_2O = 0.1, Total = 100.0. Differential thermal analysis study of coconinoite shows a large endothermic peak between 150 and 250°C, which corresponds to the water loss, and a smaller endothermic peak near 800°C, which corresponds to the loss of SO_2. (auth)

35661 SATURATION CURVE FOR FOSSIL FISSION OF ^{238}U IN MUSCOVITE. Togliatti, V. (Univ., Genoa). Boll. Geofis. Teor. Appl., 7: 251-60(Sept. 1965). (In Italian).

Use of electron microscopy to measure fission tracks in muscovite from the spontaneous disintegration of ^{238}U or neutron-induced fission of ^{235}U is discussed. The fission tracks can be identified after treatment of the mineral with hydrofluoric acid. The range of the tracks varies from 8 to 20 μ. Specimens of muscovite were examined in view of geological applications of the fossil fission track counting method in minerals. The problem was studied for the determination of the age of minerals by detecting the quantity of fissioned ^{238}U. It was found that the number of tracks reached a steady state in several samples of muscovite, the etching time with hydrofluoric acid for reaching the saturation plateau being dependent upon concentration and temperature of reagent for the same specimen. The optimum conditions for plateau length were determined for accurate mineral age determination. Since the conditions are different for different specimens of the same mineral, it is necessary in measuring the age to determine the saturation curve for each specimen. Some effects, such as high temperature, which prevent attainment of the steady state condition or which shorten the plateau length, were also studied. Intrinsic characteristics of the specimen may introduce a large error in age determination. (BBB)

35662 DISTRIBUTIONS OF RANGES AND ANGULAR DISTRIBUTIONS OF TRACKS OF FOSSIL FISSION OF ^{238}U AND OF INDUCED FISSION OF ^{235}U IN MICA. Togliatti, Vittorio (Univ., Genoa). Boll. Geofis. Teor. Appl., 7: 326-35(Dec. 1965). (In Italian).

In the course of developing a method for determining the age of minerals, based on electron microscopy of hydrofluoric acid-etched fission tracks, characteristics of the tracks were examined in detail. Both fossil fission tracks produced by disintegration of ^{238}U and thermal-neutron-induced tracks from ^{235}U were studied. The distribution function of the lengths of ^{235}U fission tracks was calculated for muscovite and biotite. The histograms of the lengths of the fission tracks of ^{235}U and ^{238}U were also determined. In both cases the average range falls between 16 and 17 μ, and the observed distributions of frequencies are symmetrical, within the limit of experimental error, with respect to the observed highest frequencies. Thus the efficiency of detection of ^{235}U and ^{238}U fission tracks is almost the same and is consistent with that previously calculated. The angular distribution function for fission tracks, reaching the etched cleavage surface, was also calculated. Experimentally determined values followed the trend of the calculated curve. The efficiency, η, equal to the ratio of the number of tracks per unit surface, intersecting a cleavage plane, to the number of fissioned atoms in R times unit volume, is $\frac{1}{2}$. (BBB)

35663 URANIUM-MICA GROUP. Walenta, Kurt. Chem. Erde, 24: 254-78(1965). (In German).

Investigations were made of uranyl arsenate and uranyl phosphate minerals of the torbernite and metatorbernite group and of their crystallochemical relations. A comparison was made between some properties of the various members of this mineral group. Water content and dehydration behavior were examined, the results showing that the water content of the existing phases is constant and does not vary zeolitically within certain limits as hitherto generally assumed. Dehydration proceeds stepwise and is accompanied by unit-cell contraction and increase of the indexes of refraction. Also dealt with are symmetry conditions and structural relations, as well as the variation of unit-cell dimensions and refractive indices with the chemical composition. Structural relations are primarily determined by size and valence of the cation. Tables provide data on the water content, unit-cell dimensions and refractive index (n_o or n_e) of the various members. Descriptions of some new synthetic phases, as well as a discussion of the uranospathite problem, are also provided. (TCO)

35664 SOME ASPECTS OF THE DISTRIBUTION OF URANIUM IN BLACK SEA WATERS. Baturin, G. N.; Kochenov, A. V.; Kovaleva, S. A. Dokl. Akad. Nauk SSSR, 166: 698-700(Jan. 21, 1966). (In Russian).

During the 16th voyage of the scientific-research ship "Mikhail Lomonosov" in August-September 1964, 46 samples were taken at various depths of the waters of the Black Sea at 16 different stations, including 15 samples of the bottom layer. According to the determinations, the uranium content of the Black Sea waters (except the bottom layer) ranges from $2 \cdot 10^{-6}$ to $4 \cdot 10^{-6}$ g/l, the average being 2.8×10^{-6} g/l. The uranium content of the bottom layer is much lower, frequently dropping to $n \times 10^{-7}$ g/l. This is attributed to the removal of uranium by adsorption on the sediments. One of the major factors in the adsorption of uranium by the sediments is thought to be the presence in the latter of organic matter whose particles can occlude this metal while it is still precipitating in the mass of the water as a result of its reaction with hydrogen sulfide contaminating the water. (CFSTI)

35665 RADIOACTIVE LATERITES IN THE NATIONAL PARK AREA. Mumme, I. A. J. Proc. Roy. Soc. N. S. Wales, 98: 101-4(1965).

Normal γ radiation intensities from various geological units exposed in the Sydney Basin were measured. These determinations were made along several hundreds of miles of traverses with an aerial scintillometer set up in a vehicle. While interpreting the radioactivity records and computing the levels of radioactivity for the various geological units traversed, anomalous readings were located that were significantly larger than the normal radiation from the Hawkesbury sandstone formation. The radioactivity was found to be associated with nodular laterite capping over large areas of the Hawkesbury sandstone in the National Park area. Readings were erratic and quite variable, and activity up to 14 μR/hr was recorded in traversing. The normal levels for the adjacent Hawkesbury sandstone was of the order of 5 μR/hr. Gamma-spectrometry measurements showed that the radioactivity was due to a thorium mineral and small amounts of radium C. The laterite capping of ironstone consists of sesquioxide of iron and some kaolin. (TCO)

35666 DATA ON THE LEVELS OF HAFNIUM AND YTTRIUM IN ZIRCONS. Chessex, Ronald; Delaloye, Michel. Schweiz. Mineral. Petrogr. Mitt., 45: 295-315 (1965). (In French).

The results presented were obtained on concentrates of zircon used in mineral age determinations by use of the x-ray fluorescence method to estimate levels of U, Th, Pb, Hf, Y, and other rare earth elements. Results of determination of Hf and Y in zircons were in good agreement with those in the literature. In igneous rocks of the calcium-alkaline series, the Zr/Hf ratios of zircons, which range from 48 to 29, decrease with the color index, i.e., from diorites to granites. In the alkaline series, zircons with the lowest Hf content are found in nepheline syenites. Content of Y showed the same trend of variation. The Zr/Hf ratios of zircons from metamorphic rocks may be considered as normal. Zircons of albitized granites are low in Hf whereas those of autometasomatic granites are very rich in both Y and Hf. Zircons of effusive rocks have more variable Zr/Hf ratios than those of plutonic rocks of the same composition. (BBB)

HEALTH AND SAFETY

See also BIOLOGY AND MEDICINE — Radiation Hazards and Protection
GEOLOGY, METEOROLOGY, AND MINERALOGY — Natural Radioactivity and Fallout

Refer also to abstracts 35278, 35284, 35786, 36441, and 36533.

35667 (IDO–17182) HEALTH PHYSICS TECHNICIAN TRAINING MANUAL. Stroschein, H. W.; Maeser, P. H. (eds.) (Phillips Petroleum Co., Idaho Falls, Idaho. Atomic Energy Div.). June 1966. Contract AT(10-1)-205. 304p. Dep. mn. CFSTI $7.00 cy, $1.50 mn.

The general principles of radiation safety covered include the basic principles of radiation, dose determination and limits, biological effects of radiation, radiation detection instrumentation, contamination control, decontamination, and emergency actions. General information is also included on non-radiological safety often associated with health physics work. (auth)

35668 (LA–3491) CHARACTERISTICS OF THE AEROSOL PRODUCED FROM BURNING SODIUM AND PLUTONIUM. Ettinger, Harry J.; Moss, William D.; Busey, Harold (Los Alamos Scientific Lab., Univ. of California, N. Mex.). Feb. 1966. Contract W-7405-eng-36. 49p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

Safety analysis of Na-cooled, Pu-fueled, fast reactor plants must be concerned with the possibility of fires involving these materials. Size characteristics of the aerosol produced during Na and Pu fires were determined for different atmospheres ranging from 20.8% O_2, 79.2% N_2 to 100% N_2. Gram quantities of metallic Na, Pu-Co-Ce alloy, and alpha- and delta-phase Pu metal were burned separately. The aerosol produced by burning gram quantities of Na was compared with that produced by a fire involving 600 pounds of Na. Data were obtained regarding the fraction of Pu alloy airborne during a Pu fire. Fires simulating a reactor accident involving both fuel and coolant defined the relative airborne concentrations of Pu and Na. (auth)

35669 (STI-PUB-114) CRITICALITY CONTROL OF FISSILE MATERIALS. Proceedings Series. Proceedings of the Symposium held by the International Atomic Energy at Stockholm, 1–5 November 1965. (International Atomic Energy Agency, Vienna (Austria)). May 1966. 756p. (CONF-651103). IAEA: $15.00; S315,-; £ 4.10.0; F Fr 60,-; DM 52,50.

Separate abstracts were prepared for 23 of the 45 papers included. The other 22 papers can be found under CONF-651103 in the report number index. (G.O.Y.)

For abstracts of individual papers see: 35445, 35684–35704, and 36441.

35670 (UCRL–14786) TABULATION OF DATA ON ANNOUNCED NUCLEAR DETONATIONS BY ALL NATIONS THROUGH 1965. Edwards, Mary A. (Lawrence Radiation Lab., Univ. of California, Livermore). Mar. 17, 1966. Contract W-7405-eng-48. 25p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The tabulation is organized by geographical location with the exception of the nuclear Vela Uniform Seismic Series which is listed separately. Sections are included on detonations by the U.S., U.S.S.R., U.K., France, and Communist China. (J.R.D.)

35671 (UCRL–14903) IMPROVED SHIPPING CONTAINER FOR FISSILE MATERIAL. Gaskill, James R.; Taylor, Robert D. (Lawrence Radiation Lab., Univ. of California, Livermore). June 3, 1966. Contract W-7405-eng-48. 28p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

An improved shipping container for fissile materials was developed. This container has passed the normal and accident tests proposed in the current revision of AEC Safety Standards. Further, a criticality analysis by the LRL Criticality Safety Advisory Group has established quantitative limits for shipping solid forms of enriched U and Pu according to AEC criteria for Class I and Class II categories. (auth)

35672 LAYOUT AND EQUIPMENT OF A LABORATORY FOR THE HANDLING OF RADIOACTIVE SUBSTANCES. Lerch, A.; Lerch, G.; Lerch, R.; Gostely, J.-J. Bull. Tech. Suisse Romande, 90: 107-13(Mar. 7, 1964). (In French).

The layout and equipment of an institute of applied radiology having 4 different radiation protection zones is described. Measures taken to minimize external radiation (protection against γ and β radiation, monitoring of external radiation) and contamination (floors, walls, doors, and ceilings; lining of workplaces, design of glove boxes and sanitary appliances; ventilation, and filtering of contaminated air; monitoring contamination) are discussed. (Occup. Safety & Health Abstr., Vol. 3, No. 6, 1965)

35673 ANALYSIS OF NUCLEAR INCIDENTS IN THE ROSPO PLATE-FUELLED REACTOR. Bona, C.; Mathis, A. Energ. Nucl. (Milan), 11: 237-47(May 1964). (In Italian).

A detailed study was made of incidents in the ROSPO plate-fuelled reactor (zero-powered reactor for the study of cores from the PRO organic reactor from the neutron angle). The following incidents are considered: uncontrolled extraction of the central control rod for cores having a minimum and a maximum number of fuel elements; the rise of the moderator level at a 2 mm/s rate for cores having the maximum number of fuel elements. The development of these incidents without any intervention of the safety system was examined and the requirements of a safety system that eliminates core damage is considered. (Occup. Safety & Health Abstr., Vol. 3, No. 6, 1965)

35674 INFLUENCE OF CLEANSING AGENTS ON SKIN ABSORPTION OF ^{90}Sr IN ANIMALS. Hodyreva, M. A. Gig. Truda Prof. Zabolev., 8: No. 10, 14-18(Oct. 1964). (In Russian).

Experiments were made on animals to determine to what extent rinsing the skin with decontaminating solutions, such as ammonium carbonate, potassium permanganate, and oxalic and hydrochloric acids, affected the cutaneous absorption of ^{90}Sr. It was found that after washing with each of these solutions, absorption of ^{90}Sr was increased, and that 16 days after application, the organs and tissues of the animals involved still contained 4.5% of the applied quantity of ^{90}Sr, compared to 2.9% in the case of a control group of animals that had undergone no previous washing. (Occup. Safety & Health Abstr., Vol. 3, No. 6, 1965)

35675 ^{137}Cs LEVELS IN FISH OF DIFFERENT LIMNOLOGICAL TYPES OF LAKES IN FINLAND DURING 1963. Kolehmainen, Seppo; Haesaenen, Erkki; Miettinen, Jorma K. (Univ. of Helsinki). Health Phys., 12: 917-22(July 1966).

The limnological characterization of twelve lakes and three rivers in different parts of Finland and ^{137}Cs analyses of several species of fish in these lakes and rivers were carried out. The lakes vary from oligotrophic (low-nutrient) lakes through dys-oligotrophic and dys-eutrophic to fully eutrophic (high-nutrient) lakes. Correspondingly, the conductivity varies from 11 to 79 mho units, the color from 5 to 100 mg Pt/l, the $KMnO_4$ consumption from 8 to

144 mg/l, and the ^{137}Cs content in different fish species in more or less direct relationship with the diminishing conductivity, e.g. perch (Perca fluviatilis) 0.2 to 20 nc/kg, pike (Esox lucius) 0.15 to 16 nc/kg, roach (Leuciscus rutilus) 0.1 to 7.5 nc/kg fresh weight, the highest values being in the fish of oligotrophic lakes, which waters have a low electrolytic conductivity. Other factors affecting the ^{137}Cs content of the fish are its feeding habits and the general limnological character of the waters. The total β-activity of the water varies only slightly and this variation evidently is not an important cause of the differences found in the ^{137}Cs content of the fish. (auth)

35676 IN-SITU MEASUREMENT OF ^{137}Cs DEPOSITION ON THE GROUND AND EVALUATION OF CURRENT STATUS OF EXTERNAL IRRADIATION TO POPULATION IN THE RESIDENTIAL DISTRICT AROUND TOKYO. Yamashita, Mikio; Oguchi, Setsuo M.; Watanabe, Hironobu (National Inst. of Radiological Sciences, Chiba, Japan). J. Nucl. Sci. Technol. (Tokyo), 3: 259-60(June 1966).

The direct determination of ^{137}Cs concentration on the ground by field application of gamma-ray spectrometry is described briefly. Survey data obtained during the period between Oct. 1965 and Jan. 1966 in the residential district around Tokyo are presented. Estimates are made of the external exposure in open spaces and in a typical house in urban districts. (L.B.S.)

35677 RADIATION PROTECTION DURING X-RAY EXAMINATION OF ANIMALS. Koczkas, Gyula; Bojtor, Ivan (Orszagos Frederic Joliot-Curie Sugarbiologiai es Sugaregeszseguegyi Kutato Intezet, Budapest). Magyar Allatorv. Lapja, 19: 28-9(Jan. 1964). (In Hungarian).

The increasing frequency of x-ray examination of animals makes it necessary to observe strict protective procedures for veterinary radiologic personnel. This, however, is made difficult by the fact that no x-ray equipment is manufactured specifically for veterinary use and the animals are of differing sizes. Due to the restlessness of the animals and the movements that may occur during handling, a high-powered apparatus and very sensitive film should be used. The examining room should be large (at least 25 m^2) with the control room at least 1.5 m from the x-ray equipment, should be of brick construction, and be provided with the equivalent of a 0.5-mm lead window of 20 × 20 cm (made of lead-glass). The cassette containing the film should never be held by hand, whether gloved or not, as the dose rate would be 85 to 850 mR/hr. A stand to hold the film was constructed and is illustrated. Its advantages are that it can hold film of any size, can be turned in any direction, and may be fixed into position by a foot lever. Smaller animals usually have to be held and this should be done with lead-rubber gloves with the equivalent of 0.5 to 0.7 mm lead. A protective screen was constructed for this purpose which can be easily lowered or raised to protect the maximum body area of the assistant. (BBB)

35678 FITNESS OF MICROCYTHEMIC SUBJECTS FOR OCCUPATIONS INVOLVING EXPOSURE TO IONIZING RADIATIONS. Strambi, E. (Univ., Rome. CNEN-CSN, Casaccia, Italy); Righi, E. Med. Lavoro, 56: 664-72(1965). (In Italian).

A study was made on about 1000 employees of a nuclear research center coming from different regions of Italy, and an incidence of microcythemia was observed in 1.5%. A cautious approach to the formulation of a medical judgement on the fitness of microcythemic subjects for working in occupations involving exposure to radiation is suggested. It is pointed out, however, that this kind of approach, which is in keeping also with public health considerations, might under some aspects turn out to be too restrictive; in fact the subjects under discussion might prove in practice to be even more resistant than normal subjects to the harmful effects of radiations. (P.C.H.)

35679 SOLUBILITY OF RADIOACTIVE PARTICLES. Bykhovskii, A. V.; Benyumov, Yu. M.; Doroshenkov, V. G. (Inst. of Medical Radiology, Academy of Medical Sciences, USSR). Med. Radiol., 11: No. 6, 65-9(June 1966). (In Russian).

A method for studying individual hot-particle dispersion from ^{60}Co sources is described. Results of an investigation of the characteristics of individual hot particles for a ^{60}Co source are given. It was found that the dispersion period (proportional to the half life of the particle) fluctuated from 4 hr to 50 days. (P.C.H.)

35680 ^{90}Sr ACTIVITY IN MILK IN 1964. Seidler, H.; Haertig, M. (Deutsche Akademie der Wissenschaften, Berlin). Nahrung, 9: 701-3(1965). (In German).

A comparison was made of the monthly means of strontium-90 activity in milk (Potsdam area), fallout and air activities, and rainfall. The annual mean activity in milk amounted to 10.5 strontium units. (P.C.H.)

35681 SAFE WORKING WITH SEALED RADIOACTIVE SOURCES. Broszkiewicz, R. Ochrona Pracy, 18: No. 11, 3-7(Nov. 1963). (In Polish).

A description is given of 3 sealed sources presently in use in the Polish Nuclear Research Institute: the Canadian completely shielded, but extremely expensive, Gammacell 200; and 2 sources constructed in Poland on which the shielding is inadequate and for which strict safety measures are necessary (warning signs and instructions, education of workers, regular checks on dose levels received, periodical medical examinations, fire protection and strict control of the number of persons coming in contact with the source). (TCO)

35682 DISTRIBUTION OF ^{90}Sr AND ^{137}Cs IN THE HUMAN BODY AFTER CONSUMPTION OF SOME MARINE ANIMALS. Mironov, O. G. Okeanologiya, 4: No. 6, 1059-61(1964). (In Russian).

Uptake of ^{90}Sr and ^{137}Cs by marine animals of commercial importance as human food sources is considered, and data are presented showing that these sources provide a significant amount of contamination of human tissues by these radionuclides. (BBB)

35683 PROTECTION OF CHILDREN AGAINST THE ACTION OF IONIZING RADIATIONS. Chisleag, G.; Mardare, D. (Institutul de Medicina si Farmacie, Iasi). Pediatria (Bucharest), 13: 465-73(Sept.-Oct. 1964). (In Rumanian).

An analysis is made of the extent and possible effects of exposure of children to ionizing radiation, mainly from diagnostic radiology, and recommendations are made for reducing the hazards to a minimum. One problem in pediatric radiology stems from the fact that a proportionately larger volume of the total body of children is irradiated as compared with adults. Thus bone marrow and gonadal doses are generally higher in children. The possible somatic and genetic implications of such exposure are examined, with particular reference to leukemogenesis and mutations. Ways in which pediatric radiation exposure has been lowered in radiodiagnosis are considered, such as the reduced dependence on fluoroscopy today and adjuncts such as television and image intensification. Recommendations for reducing pediatric doses in fluoroscopy include: better dark adaptation of the radiologist's eyes, use of diaphragms which will exclude the gonads from the beam, filtration with 2 mm of aluminum, and use of more sensitive screens. Recommendations are also made for dose lowering in radiography. A plea is made for better training of personnel of radiology departments so that hazards can be reduced to both themselves and their patients. (BBB)

35684 FUNDAMENTAL DATA RELATING TO THE CRITICALITY OF SIMPLE SYSTEMS. Fruchard, Y.; Leclerc, J.; Mougniot, J. C.; Penet, F.; Puit, J. C. (Commissariat a l'Energie Atomique, Paris). pp 13-33 of STI-PUB-114. (In French).

Some studies that served as the basis for the criticality guide recently published by the French Commissariat à l'Energie Atomique are summarized. Reflected critical values for a water reflector of infinite thickness are proposed as a function of the concentration of fissile materials. The differences from the published minimum critical values for uranium of low enrichment are interpreted. The proposed standards apply to neutronically homogeneous media. The

various types of heterogeneity are defined, and rules are proposed for determining whether a unit can be regarded as neutronically homogeneous. (D.C.W.)

35685 SOLID ANGLE METHOD FOR EVALUATING THE INTERACTION BETWEEN FISSILE UNITS. Leclerc, J.; Lombard, C.; Moret-Bailly, J.; Mougniot, J. C.; Penet, F. (Commissariat a l'Energie Atomique, Paris). pp 73-86 of STI-PUB-114. (In French).

The matrix equation for obtaining the K_{eff} of an assembly of identical or non-identical units from the k_{eff} of each isolated unit and the solid angles between the different units is briefly described. From this equation simplified rules are derived which can be used to yield the conventional criteria of the limiting solid angle method. The limits within which the initial equation is valid are discussed using the hypothesis of emission isotropy. A short account is given of the SEC 043 program for the IBM 7094 computer. This program solves the proposed matrix equation and gives the K_{eff} of the assembly of units and the upper limits corresponding to different approximations. The hypothesis of semi-reflection of the units is employed, discussed, and compared with the reflection conditions for plane walls. Numerical results for simple systems are compared with results obtained using the Monte Carlo method. The relative advantages of these two programs are discussed. A brief account is given of the application of the solid angle method to plant design and the simple equations are established. (auth)

35686 METHODS USED IN CRITICALITY CALCULATIONS; MONTE CARLO METHOD, NEUTRON INTERACTION, PROGRAMMES FOR IBM-7094. Moreau, J.-M.; Parisot, B.; Rabot, H.; Robin, C. (Commissariat a l'Energie Atomique, Paris). pp 129-46 of STI-PUB-114. (In French).

The possible uses and limitations of the diffusion and transport theories for criticality calculations are discussed with emphasis on the use of the Monte Carlo method. Four particularly important codes, and their variants, are described; and some basic results are presented. The accuracy of the various methods of calculation are compared. (D.C.W.)

35687 MEASUREMENTS OF THE CRITICAL PARAMETERS OF UNDER-MODERATED URANIUM–HYDROGEN MIXTURES AT INTERMEDIATE ENRICHMENTS. Lane, R. C. (Atomic Weapons Research Establishment, Aldermaston, Eng.). pp 177-91 of STI-PUB-114.

The critical size of mixtures of 30% enriched uranium oxide and wax with $H/^{235}U$ in the range 8 to 80 and 37½% enriched uranium metal, as used in Zebra, were estimated by extrapolation from high multiplication assemblies. The cores were constructed in rectangular geometry from small blocks to facilitate stacking changes. Reflectors included polyethylene, Perspex, concrete and wood. The effect of other reflectors was estimated by replacement of one face of an otherwise polyethylene-reflected cube by the material of interest. Evidence is given that critical masses derived by this method are correct to within 5%, even when the spectrum of neutrons returned to the core from the replacement face is markedly different from that returned from the remainder of the reflector. Density exponents were estimated from measurements with low-density blocks, and one carbon dilution exponent is reported. The critical size of half-reflected cores is of interest to the criticality assessor. The parameters obtained from a near cube and a long pipe suggest that their dimensions are the arithmetic mean of those of bare and completely reflected cores of the same shape. The neutron interaction between partially reflected cores can be greater than that for the uniformly reflected case. To check the magnitude of this effect, two identical cores were reflected on all but the adjoining faces by polyethylene, and their critical separation was determined. The measurement was then repeated with the cores fully reflected, or with the polyethylene filling only the space between the reflector, leaving free space between the cores. Selected assemblies were rebuilt with a layer of cadmium between the core and the reflector to estimate its effect on critical size. (auth)

35688 EXPERIMENTAL RESEARCH IN FRANCE ON CRITICALITY PROBLEMS. Clouet d'Orval, C.; Deilgat, E.; Houelle, M.; Lecorche, P. (Commissariat a l'Energie Atomique, Paris). pp 193-213 of STI-PUB-114. (In French).

A brief survey of the French experimental facilities and research program for criticality studies on plutonium and uranium solutions is presented. Experiments on cylindrical assemblies are emphasized. (D.C.W.)

35689 INTERPRETATION OF EXPERIMENTAL RESULTS OBTAINED AT THE VALDUC CRITICALITY STATION. Caizergues, R.; Fiegel, A.; Ithurralde, M. F. (Commissariat a l'Energie Atomique, Paris). pp 249-66 of STI-PUB-114. (In French).

The results of some criticality studies on aqueous solutions of plutonium nitrate in various geometries are summarized. The effects of the variation of the acidity and the ^{240}Pu content were studied. The experimental results are compared with the results of calculations. (D.C.W.)

35690 CRITICAL PARAMETERS OF AQUEOUS SOLUTIONS OF $UO_2(NO_3)_2$ AND THE INTERACTION OF SUBCRITICAL HOMOGENEOUS ASSEMBLIES. Dubrovskii, B. G.; Kamaev, A. V.; Vladykov, G. M.; Bogartyrev, V. K.; Gurin, V. N.; Kuznetsov, F. M.; Sviridenko, V. Ya. (Inst. of Power Engineering at the USSR State Atomic Energy Commission, Obninsk). pp 267-78 of STI-PUB-114. (In Russian).

The results of experiments and calculations on the critical parameters of aqueous solutions of the salt $UO_2(NO_3)_2$ at enrichments of 5%, 10%, 36%, and 90% are presented. Measurements were made over a wide range of uranium concentrations in the solution in cylindrical vessels, flat slabs, parallelepipeds, and spheres, with water reflector and without reflector. Extrapolation lengths and geometrical parameters χ^2 were determined. The relation between the critical parameters and the nitrogen content of the solution is discussed. The minimum critical dimensions of a flat infinite layer and an infinite cylinder were determined. Measurements were made with the addition of different reflectors — water, graphite, steel and beryllium. The experimental data are compared with calculations from the equations obtained using an empirical slowing-down kernel. Multigroup calculations were carried out for the critical parameters of aqueous solutions in P_1 and P_3 approximations of the spherical harmonics method. Good agreement was obtained between the experimental and theoretical results. The results of experiments for determining the interaction between two, three and five subcritical assemblies, in the form of cylinders and parallelepipeds, in air and water are described. Critical parameters are also given for a system of many homogeneous sub-critical assemblies with and without reflector. Critical parameters for interacting systems of complex form such as intersecting cylinders and flat slabs at different angles are obtained. The spatial distribution of neutron fluxes is studied for interacting sub-critical assemblies, with and without an intervening absorber, for different k_{eff} ratios of the interacting assemblies. (G.O.Y.)

35691 BASIC PHILOSOPHIES FOR NUCLEAR CRITICALITY SAFETY. McCluggage, W. C. (Div. of Operational Safety, U. S. Atomic Energy Commission, Washington, D. C.). pp 365-75 of STI-PUB-114.

Three ultraconservative concepts that formed the basis for most of the early work and thought pertinent to nuclear criticality safety are discussed in some detail. These concepts are: there shall be no accidental nuclear chain reactions; nuclear safety is the absence of unplanned chain reactions; and accidental nuclear excursion invariably causes widespread radiation injury. (auth)

35692 SOME QUESTIONS OF NUCLEAR SAFETY. Dubrovskii, B. G.; Kamaev, A. V.; Vladykov, G. M.; Bogatyrev, V. K.; Gurin, V. N.; Kuznetsov, F. M.; Sviridenko, V. Ya.; Diev, L. V. (Inst. of Power Engineering at the USSR State Atomic Energy Commission, Obninsk). pp 387-96 of STI-PUB-114. (In Russian).

The results of some experiments and calculations on the effectiveness of annular absorbing inserts and absorber rod grids in homogeneous, water-uranium critical assemblies are presented. Their effectiveness was estimated from the change in critical volume of a solution of uranium when an absorber is introduced into the core and also into reactivity units. The experiments to determine the effectiveness of absorbing inserts were performed with aqueous solutions of $UO_2(NO_3)_2$ (90% enriched uranium) in the concentration range 34 to 500 g/l. The effectiveness of thin absorbing inserts with cadmium and boron carbide and of cadmium–water and steel inserts in cylindrical vessels was studied with water reflectors and without reflectors. The dependence of effectiveness on the geometrical dimensions of the inserts, the diameter of the core, and the uranium concentration in the solution was studied. The maximum effectiveness was found to be possessed by annular inserts with a mean radius $r = (0.4 - 0.5)R_e$, where R_e is the equivalent radius of the assembly. Experiments to determine the effectiveness of absorber rod grids were carried out with aqueous solutions of $UO_2(NO_3)_2$ (uranium enriched to 5, 10, and 90%) in a cylindrical tank of diameter 1100 mm. Grids of boron carbide rods occupied 10 to 40% of the core volume. The critical mass in this reactor amounted to 100 kg of ^{235}U. Multigroup calculations of the effectiveness of inserts and rod grids were made in a P_1 approximation; there was satisfactory agreement with the experiment. It is shown that the use of absorbing inserts and grids of rods constitutes an efficient method of ensuring nuclear safety in the processing and storing of large volumes of solutions of fissile materials. An account is also given of methods of calculating the critical parameters of bodies of irregular shape. A general method is proposed for calculating the geometrical parameter of a body of arbitrary shape. Calculations of the critical size of bodies in the form of cones, hemispheres, and intersecting cylinders are compared with experimental values. A table of integrals is given for calculating geometrical parameters. (auth)

35693 NUCLEAR SAFETY ASPECTS OF THE DESIGN AND OPERATION OF A PLANT FOR THE PRODUCTION OF FAST REACTOR FUEL. Lane, R. C.; Parker, C.; Brown, F.; Stevenson, D. G. (Atomic Weapons Research Establishment, Aldermaston, Eng.). pp 399-410 of STI-PUB-114.

A method was developed for deriving specific safe estimates of the critical parameters of certain materials, starting from published plutonium/water data. This requires accurate information on the composition and density of the materials which are or could be present at each stage of the process. The techniques used for assessing individual items, based on limitation of mass, geometry, or both, are discussed, and the effect of the data on plant designs is considered. Limitations on spacing between vessels arise from the effect of neutron interaction. It is shown that safety factors must be allowed to cover errors in the basic data and any uncertainty in the degree of reflection, etc. Close collaboration between criticality assessors, plant designers and operators is necessary if the optimum solution is to be achieved, and also if all feasible abnormal conditions are to be recognized and allowed for. In operation, a "movement controller" is appointed to oversee all movements of fissile materials between sections of plant or stores, and to ensure that mass limits are not exceeded and that all relevant weight and analytical data are available. (G.O.Y.)

35694 DESIGN AND OPERATION OF INDUSTRIAL ASSEMBLIES PRESENTING CRITICALITY HAZARDS: EXPERIENCE WITH FRENCH INSTALLATIONS. Cantel, J.; Fruchard, Y.; Lavie, J.-M.; Leclerc, J.; Michel, P.; Nollet, P. G. (Commissariat a l'Energie Atomique, Paris). pp 411-18 of STI-PUB-114. (In French).

The French experience in the design and operation of installations that present criticality hazards is outlined. The choice of a control system and its position and operation are emphasized. (G.O.Y.)

35695 STUDIES IN CRITICALITY CONTROL: DESIGN CRITERIA. Lewis, W. B. (Phillips Petroleum Co., Idaho Falls, Idaho). pp 437-59 of STI-PUB-114.

Some criteria are developed to assist plant designers, operating personnel, and safeguards review groups in eliminating criticality hazards normally associated with operating nuclear reactors and chemical plants processing fissionable material. The criteria show unambiguously what situations are safe and what situations require more elaborate analysis before they can be classified as safe or hazardous. The criteria are displayed as families of curves which attempt to cover the entire range of interesting values of a system's parameters. The general systems are easily related to specific problems. (auth)

35696 NEW APPROACH TO THE MULTIPLE CONTINGENCY PRINCIPLE EMPLOYED IN CRITICALITY CONTROL. Schueller, W.; Zuend, H. (European Company for the Chemical Processing of Irradiated Fuels, Mol, Belg.). pp 497-516 of STI-PUB-114.

If applied in the usual way by merely counting the number of contingencies, the multiple contingency principle has two essentially weak points: there is no clear definition of what may be considered an acceptable contingency; and no relation is established between the potential consequences of an accident and the acceptable probability of its occurrence. To overcome these deficiencies, each contingency is given a weight factor, which is related to the logarithm of its failure probability. This permits the addition of contingencies and the determination of the probability of a certain chain of events which could lead to an accident. It is then possible to limit the probability of a nuclear excursion to a low but finite value which can be adjusted to the conceivable consequence of such an accident. This approach does not eliminate the need to use experience and technical judgement in assessing the reliability of equipment components or human actions. However, it is believed to facilitate a systematic and uniform safety analysis of a complex plant. (auth)

35697 MANAGEMENT OF NUCLEAR SAFETY IN THE USA: ADMINISTRATIVE PROCEDURES FOR CONTROL. Stevenson, R. L.; Chitwood, R. B. (U. S. Atomic Energy Commission, Washington, D. C.). pp 517-30 of STI-PUB-114.

The essentials for a program for the prevention of accidental criticality are defined, and detailed appraisals are given for those facets requisite to successful implementation of a two-contingency policy. In all cases the successful incorporation of the above elements depends upon management attitude, clearly defined functions and responsibilities, and well-understood working relations between the responsible individuals. The interaction of these requisites is characterized by analyses of organizations spanning the range of complexity and criticality hazard potential encountered in the industry. The importance of each of the many facets of control such as the selection of design approaches, training programs, nuclear safety specifications, etc., is placed in perspective by referring to operating experience and by defining the best features of each. (auth)

35698 TYPES AND METHODS OF STORING FISSILE PRODUCTS. Gey, A.; Caizergues, R.; Cantel, J.; Grieneisen, A. (Commissariat a l'Energie Atomique, Paris). pp 553-65 of STI-PUB-114. (In French).

The physico-chemical nature and the form of the products to be stored, the nature of the elementary units, and the overall structure of the stores (arrays) are discussed. A number of practical rules for storage are derived and are demonstrated. (D.C.W.)

35699 CONTROL OF CRITICALITY HAZARDS AT HARWELL. Jefferson-Loveday, D. W. (Atomic Energy Research Establishment, Harwell, Eng.). pp 569-81 of STI-PUB-114.

Some of the criticality-control procedures that have been developed at Harwell are reviewed. (D.C.W.)

35700 USAEC CONTROLS FOR NUCLEAR CRITICALITY SAFETY. McCluggage, W. C. (Div. of Operational Safety, U. S. Atomic Energy Commission, Washington, D. C.). pp 583-96 of STI-PUB-114.

A brief survey of USAEC controls for criticality safety

in its facilities and plants is presented. The functions of both the USAEC and USAEC contractors are considered. (D.C.W.)

35701 ADMINISTERING CRITICALITY CONTROL IN THE HANFORD ATOMIC PRODUCTS OPERATION CHEMICAL PROCESSING DEPARTMENT. Kiel, G. R.; Ridgway, K. R.; Carter, R. D. (General Electric Co., Richland, Wash. Hanford Atomic Products Operation). pp 597-607 of STI-PUB-114.

The administrative procedures used to control nuclear criticality during the processing of slightly enriched U, ^{233}U, and Pu are briefly reviewed. The general administrative procedures, AEC relations, technical criteria, use of water for fire fighting, audits, equipment changes, and personnel training programs are covered. (D.C.W.)

35702 NUCLEAR SAFETY CONTROL IN A FUEL FABRICATION OPERATION. Honkonen, D. L. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Plant). pp 641-51 of STI-PUB-114.

The safety controls that are used at Savannah River in the fabrication of Al-U or slightly enriched U fuel elements are outlined. (D.C.W.)

35703 CRITICALITY STUDIES IN A PILOT PLANT FOR PROCESSING MTR-TYPE IRRADIATED FUELS. Pereira Sanchez, G.; Uriarte Hueda, A. (Junta de Energia Nuclear, Division de Materiales, Madrid). pp 679-98 of STI-PUB-114. (In Spanish).

A series of theoretical safety studies that were carried out in a pilot plant for the processing of irradiated fuels from the MTR-type reactor JEN-1 are summarized. Aqueous and organic solutions with ^{235}U enrichments of 20 and 93% were considered in the studies. (D.C.W.)

35704 PREVENTION OF THE CAUSES AND CONSEQUENCES OF CRITICALITY ACCIDENTS: MEASURES ADOPTED IN FRANCE. Fruchard, Y.; Lavie, J.-M. (Commissariat a l'Energie Atomique, Paris). pp 717-36 of STI-PUB-114.

A detailed analysis of the known causes and consequences of past criticality accidents is given; and, on this basis, some comments are made in connection with the validity of traditional safety criteria, the probability of accidents for different types of operation, the characteristic accidents capable of serving as models, and the extent of possible radiological consequences. The measures adopted in France to limit the consequences of a possible criticality accident (location, design, and layout of installations and accident detection dosimetry for exposed personnel) are briefly described after a short account of the criteria used in selecting them. The economic implications of adopting particular precautionary measures and of applying them uniformly, taking due account of the question of reliability, are also discussed. (G.O.Y.)

35705 ACCUMULATION OF RADIONUCLIDES IN LICHENS AND MOSSES IN THE FOOD CHAIN: LICHEN, REINDEER, AND MAN. Liden, K. (Univ., Lund, Sweden). Suomen Kem., A 39: No. 2, 18-28(1966). (In Swedish).

Radioisotope deposition in certain areas of Sweden were determined from precipitation data for the period 1961 to 1965. The amounts of individual gamma emitting radioisotopes in vegetation, reindeer meat, and man were determined for the corresponding period. A steady increase was found in the amount of ^{137}Cs in precipitation, lichens, and male Lapps and a peak in precipitation was reached in 1963. The amount of ^{137}Cs in reindeer meat also increased, but lagged behind the amounts found in lichens and man. (P.C.H.)

35706 NUCLEAR WEAPONS AND WORLD SANITY. Pauling, Linus (California Inst. of Tech., Pasadena). UNESCO Courier, 17: 6-10(Nov. 1964).

Estimates are given of the genetic and somatic injury that human populations are exposed to from radioactive fallout. High-energy radiation is known to cause gene mutation, and it is possible to estimate the gene mutations resulting from cesium-137, carbon-14, and other radioactive nuclei produced in the testing of nuclear weapons and liberated into the atmosphere. These radioactive substances, particularly carbon-14, would continue to produce defective children for thousands of years. The author calculates that the genetic damage done by high-energy radiation from the bomb tests carried out thus far, amounting to 600 Mton, will in the course of time affect 16 million children so severely that they will suffer gross physical or mental defects or embryonic, neonatal, or childhood deaths. About 1% of this total, or 160,000 infants, will be affected in the first generation, but the damage will continue with only a slight decrease generation after generation for thousands of years. The figure of 160,000 is small when compared to four million or so children who are born each year with gross physical or mental defects caused by natural radioactivity, cosmic radiation, and other causes of gene defects which cannot be prevented. The figure of 16 million that has been given is considered uncertain by a factor of ±five, i.e., three million or 80 million and the uncertainties could be greater than this. One 20-Mton bomb detonated in the atmosphere or at the surface of the earth liberates radioactive materials into the atmosphere which will cause gross damage or death to an estimated 550,000 unborn children. On the principle that high-energy radiation is also cancerogenic, it is possible to estimate that two million human beings now living will die five to 20 years earlier than otherwise because of cancer or other diseases produced by the high-energy radiation liberated in the bomb tests carried out so far. If there were to be a nuclear war, the destructive and lethal effects of blast, fire, immediate high-energy radiation and effects of local fallout, survivors within hundreds of miles of where the bombs exploded would be exposed to about half the lethal dose that causes acute radiation sickness and death within a few days, and the survivors would have their longevity and their portion of the human germ plasm pool seriously affected. Other aspects of the destructiveness of nuclear weapons are also considered. (TCO)

35707 FALLOUT HAZARDS—NOW AND YESTERDAY. Kuzin, Alexander M. (U. N. Scientific Committee on the Effects of Atomic Radiation, New York). UNESCO Courier, 17: 11-13(Nov. 1964).

An assessment is made of the past, present, and future extent of radioactive fallout, its effects on humans, and particularly the effect of the Nuclear Test Ban Treaty on worldwide contamination. Assuming radioactive debris remains in the atmosphere for an average of two years, after 1965 there should be a sharp cumulative drop in the fallout of strontium-90 and cesium-137. The overall amount of strontium-90 and cesium-137 in the soil is still rising and will continue to rise for another two or three years, when it will decline due to radioactive decay. However, far less of these substances will be absorbed by human beings in 1965 than in 1962-1963. Plants will take in strontium and cesium through root diffusion, but fresh radioactive substances which are deposited directly on the leaves of growing plants are absorbed at a much greater rate. In the years of peak fallout, the bulk of the radioactive contamination of vegetable foods took place through new fallout. Because of the Test Ban Treaty, new fallout began to decrease as early as 1964, and a considerable reduction is expected in 1965. This will lessen the radioactive pollution of foods. Over the years the reduction will be even more marked. With the cessation of tests, the environment will be gradually cleared of artificial radiocarbon. Although it has a long half-life (nearly 5,000 years), it will be disappearing as it dissolves in the waters of the oceans. The U. N. Committee on the Effects of Atomic Radiation estimates that if the Test Ban Treaty is observed, the artificial radiocarbon content will fall from 85% above the natural level in 1964, to 60% in 1969, and that it will be down to 3% by the end of the century. During the tests large amounts of radioiodine, radiostrontium, and radiocesium were being absorbed by children via milk, and that the strontium-90 content in children's bones was increasing from year to year. However, their food is now

being freed of these radioelements. It is entirely free of radioiodine, and the amount of other radioactive substances is dropping. (TCO)

35708 INVESTIGATION OF A GROUP OF NORWEGIAN SCHOOL CHILDREN WITH REGARD TO BODY BURDEN OF ^{137}Cs DUE TO RADIOACTIVE FALLOUT. Madshus, Kjell (Norsk Hydro's Inst. for Cancer Research, Oslo); Stroemme, Aksel. Z. Naturforsch., 21b: 440-2(May 1966).

The ^{137}Cs body burden in three groups of children from the same school is presented (Group I: boys aged 19 years, Group II: boys aged 15 years, Group III: girls aged 15 years). A comparison between the three groups showed that the ^{137}Cs body burden in Group I was twice as high as those in the other two groups, between which there was only a negligible difference. Since the diet was principally the same for all participants, it is suggested that the ^{137}Cs metabolism changes between the ages of 15 and 19 years. It was impossible in any of the three groups to find a correlation between the daily milk intake and the ^{137}Cs body burden. (auth)

35709 EQUIPPING VETERINARY INVESTIGATION CENTERS WITH APPARATUS FOR MEASURING RADIOACTIVE CONTAMINATION OF FOODSTUFFS OF ANIMAL ORIGIN. Kotter, L.; Kreuzer, W. (Univ., Munich). Zentralbl. Veterinaermed., Reihe B, 12: 633-7(Dec. 1965). (In German).

The various types of instruments which are useful to detect contamination with radionuclides at fallout levels are discussed, with consideration of their advantages and disadvantages for various purposes. The following types of apparatus are recommended for Veterinary Investigation Centers so that they can monitor foodstuffs of animal origin (particularly meat and meat products, eggs, and in some cases milk) for their content of radionuclides (particularly ^{137}Cs and ^{90}Sr): (1) To detect radioactive materials emitting γ rays a multiple-channel pulse analyzer (400 channels), together with accessories (such as 3×3 in sodium iodide scintillation detector, protective chamber of lead, lead-mercury, or steel, and a direct-reading or magnetic tape recorder). (2) To detect β activity an automatic low-level anticoincidence meter. The sample holders for the latter apparatus should be 30 or 60 mm in dia. The use of these instruments for various problems in veterinary monitoring work is discussed. (BBB)

35710 METHOD FOR CLEANING THE GAS, e.g., AIR, CONTAINING RADIOACTIVE SUBSTANCES. Kikuchi, Seishi (to Japan Atomic Energy Research Institute). Japanese Patent 1965-5000. Mar. 16, 1965. Filed Apr. 18, 1962.

The method proposed features the easy replacement of a filter at the time of a major radiation accident. Air containing radioactive substances (or dusts) is passed through two filters installed one above the other. The dusts, trapped in the first filter, can be released into the second filter, by a mechanical or other method. The second filter, in which the dusts are caught, is replaced with a new one. The procedure can be repeated as often as is necessary. (NSA of Japan)

INSTRUMENTATION

General

Refer also to abstract 35966.

35711 (AERE-R-4878) A QUANTISING HALF-TONE GENERATOR FOR FACSIMILE RECORDING. Cole, H. A. (Atomic Energy Research Establishment, Harwell (England)). June 1966. 24p. Dep. BIS $0.90. HMSO 4s. 6d.

An electronic unit is described which enables the amplitude of a continuously varying analog signal to be quantized into six pre-selected channels within the range 0 to (+) 10 v. The boundaries of the channels are defined by six discriminators which are connected via logic circuits to control the conduction of six associated current generators. The currents produced by the generators are used to produce a half-tone record on the chart of a facsimile recorder. By pre-setting the generator currents to represent a given amplitude channel, a quantized facsimile of the analog signal may be produced in the form of a half-tone recording. (auth)

35712 (ANL-7178) STEADY-STATE DIFFERENTIAL CALORIMETER USED TO MEASURE GAMMA HEATING IN A REACTOR ENVIRONMENT. Herbst, Dale A.; Talboy, James H. (Argonne National Lab., Ill.). Mar. 1966. Contract W-31-109-eng-38. 31p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The description and operation of a steady-state differential calorimeter designed to measure gamma heat deposited in different samples in reactors are presented. (B.G.D.)

35713 (BNWL-15) IMPROVED CARTRIDGE-TYPE LINEAR VARIABLE DIFFERENTIAL TRANSFORMER. Weihermiller, W. B. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). Jan. 1965. Contract AT(45-1)-1830. 12p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A report is presented on the development, testing and design of a cartridge type linear variable differential transformer with features that provide free linear movement without measurable lateral deflection, high resistance to clamping forces, low hysteresis, longer maintenance free operation, and easier maintenance. (auth)

35714 (CEA-R-2907) ETUDE THEORIQUE D'UN PROCESSUS ALEATOIRE DERIVE D'UN PROCESSUS DE POISSON PAR DIVISION. (Theoretical Study of a Random Process Derived From a Poisson Process by Division). Freycenon, Jacques (Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires). Mar. 1966. 46p. Dep. mn.

The time distribution of impulses issuing from a scaler (the "divider") is studied when the input consists of impulses obeying a Poisson distribution. The variance of a single counting and the correlation between successive countings are computed. One derives then the autocorrelation function and spectral density of the instantaneous counting rate at the divider output. These results are applied to the Fourier analysis of the periodic sampling of the number of impulses issuing from the divider. It is shown that if one tries to increase the information rate received in the sampling device by mixing the impulses coming from several detectors, he can lower, by division, the mean counting rate of the sum signal without practically losing information. The division must take place after mixing but not before. (auth)

35715 (IEA-104) PULSADOR ELETRONICO PARA DISPOSITIVOS ELETROMECANICOS. (Electronic Pulse Generators for Electromechanical Devices). da Silva, Ruy Borges (Instituto de Energia Atomica, Sao Paulo (Brazil)). Aug. 1965. 13p. Dep. mn.

An electronic low frequency pulse generator was developed for driving electromechanical units, with the precision and the stability necessary in most scientific and industrial applications. The repetition rate and the delay that determine state duration are adjustables. The circuit is semitransistorized, simple and economic, basically constituted of a monostable multivibrator triggered by a pulse generator, formed by an RC circuit and a cold cathode gas tube. (auth)

35716 X-RAY DILATOMETER. Bottom, Virgil E. (Univ. of Sao Paulo, Brazil). Contract Nonr-3534. An. Acad. Brasil. Cienc., 37: 407-13(Dec. 1965).

An x-ray dilatometer for measuring the strain in crystals resulting from temperature changes, radiation damage, etc., is described. Two identical crystals, one of which is the subject crystal, are mounted in the parallel position. A beam of continuous radiation is incident on the first crystal at an angle of 89°. The diffracted beam of wavelength λ is incident on the second crystal at the same angle where it is again diffracted. Any change in the lattice spacing of the first crystal causes it to diffract a slightly different wavelength λ'. The second crystal must be rotated by a small angle γ in order to diffract λ'. The dilatation of the first crystal is given by $\Delta a/a = \cos\gamma + \cot\Theta \sin\gamma - 1 \approx \gamma \cot\Theta$. The instrument utilizes the high-lattice dispersion of the high-angle position and the low-wavelength dispersion of the parallel position. The errors inherent in the instrument are discussed and it is shown that the only significant errors are those involved in measuring the angles Θ and γ. (auth)

35717 PROSPECTS OF NUCLEAR INSTRUMENTATION. Pottier, J. (CEN, Saclay, France). Bull. Inform. Sci. Tech., No. 104, Suppl., 3-5(May 1966). (In French).

The utilization of nuclear electronics in basic research, metrology, and applied research is briefly indicated. The evolution of nuclear instrumentation motivated by needs and by the appearance of new components is considered. (J.S.R.)

35718 RECENT DEVELOPMENTS IN THE AREA OF STANDARD PULSE GENERATORS. Olivier, R. Bull. Inform. Sci. Tech. (Paris), No. 104, Suppl., 35-40(May 1966). (In French).

The development of standard pulse generators is briefly reviewed. The P 640 modular generator is described with respect to its construction and constituent parts. New subassemblies presently under study are summarized. (J.S.R.)

35719 CHARACTERIZATION OF POSITIVE PLATES OF LEAD BATTERIES DURING X-RAY DIFFRACTION. Kordes, Dieter (Robert Bosch GmbH, Stuttgart). Chem.-Ing.-Tech., 38: 638-42(June 1966). (In German).

The electric properties of lead batteries were modified by the α- and β-PbO_2 concentration in the + plates and by the degree of crystallinity. Data on the structure of the plates and their α- and β-PbO_2 concentration was obtained by x-ray and neutron diffraction studies and thermal analysis. Pure α- and β-PbO_2 were prepared and studied as calibration materials. Measurements showed that in the course of charge/discharge cycles the degree of crystallinity of the PbO_2 increases and the α- and β-PbO_2 content is modified. (tr-auth)

35720 HIGH-RESOLUTION MASS SPECTROMETRY. PRINCIPLES, APPARATUS, APPLICATIONS. Le Moan, Georges; Valdener, Georges; Chaigneau, Marcel (Univ., Paris). Chim. Ind. (Paris), 95: 162-83(Feb. 1965). (In French).

Analysis of ions by mass spectrometry is considered from the viewpoint of action by a uniform electric field, and by a uniform magnetic field. The essential parts of a mass spectrometer are illustrated, and a discussion of resolution is given. Low- and medium-resolution instru-

ments are magnetic-field instruments (Dempster, Bleakney, Sampson and Bleakney) or combined electric and magnetic (Aston, Bainbridge), or use other methods (omegatron, chronotron, synchrometer, cyclotron, time of flight, quadrupole). Elements such as radius of curvature, slit width, and other aberrations must be optimized for high resolution; one may have velocity focusing, angle focusing, or double focusing. One-mass instruments with double focusing include those of Dempster, and Bainbridge and Jordan; double-focusing instruments for all masses include those of Mattauch and Herzog, Ewald, and Nier and Roberts. Cyclotron and quadrupole instruments also have attained high resolution. Tables of doublets and use of high resolution to interpret structures of complex compounds are outlined, as well as discussion of molecular rearrangements induced by electron impact. (BBB)

35721 PULSED VON ARDENNE SOURCE WITH EMISSIVE POINTS. Delbarre, Jean-Pierre; Faure, Jean; Noel, Roger; Vienet, Roger (CEN, Gif-sur-Yvette, France). Compt. Rend., Ser. B, 262: 1494-7(June 13, 1966). (In French).

The filament on a von Ardenne source was replaced by a group of emissive points. By thermionic emission these points maintain a correct current pulse corresponding to classical operation: a pulse beam of 80 mamp with an emittance of 1.8×10^{-6} mrd was extracted from this source. (tr-auth)

35722 CONSTANT-CURRENT SOURCE /Q-2745/ (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-1395).

3 drawings.

Constant-current sources were designed for use as reference sources for the calibration of electrometers or current integrators in the 10^{-12} and 10^{-10} amp range. The source, a parallel-plate ionization chamber with an internal ^{241}Am α source, is operated with externally applied voltage in excess of the minimum saturation voltage. This limits the current flow through the chamber essentially to the ion current from α particle ionization of the gas between the parallel plates. The effect of external radiation on the chamber current is reduced by limiting the active volume between the parallel plates and by lining the outer cover with lead. Change in chamber current with time is negligible due to the half lives of ^{241}Am and of its decay product ^{237}Np. The source has low saturation voltage, double containment of the α source, shock mounting, and reduced interference. Argon is used as a filling gas at a pressure of 80 cm Hg absolute. (For details, see TID-4100.) (TCO)

35723 MINIATURE PULSE GENERATOR /Q-2237/ (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-1294).

3 drawings.

A miniature, battery operated, pulse generator was designed to be self contained in an Al can $3\frac{7}{8}$ in. × $1\frac{7}{8}$ in. × $1\frac{7}{16}$ in. (For details, see TID-4100.) (TCO)

35724 TELEMETERING TRANSMITTER /Q-2714/ (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-1352).

1 drawing.

A transmitter was designed for use with an anemometer count-rate meter. An anemometer driven generator produces an a-c signal with amplitude and frequency proportional to the air speed. The first two stages are voltage amplifiers, the 3rd and 4th stage comprise a trigger circuit which produces a pulse whose amplitude is independent of the generator speed but whose frequency is the same as the generator frequency. The pulse is shaped and amplified in the 5th and 6th stages, and squared at a 5.5 v diode. The pulse appearing at the output has a pulse-width and amplitude independent of the generator frequency, but a repetition-rate the same as the generator frequency. Pulses from the pulse-shaper drive the meter circuit to a constant current for the duration of the pulse. This current is integrated in a 7500 μf capacitor. The current in the μ ammeter and the output current to the recorder is proportional to the frequency of the generator. If the circuit is properly adjusted and calibrated, the calibration control adjusts the full-scale reading of the output for desired maximum input with any external load of up to 5000 Ω so that the signal may be transmitted by telephone lines. (For details, see TID-4100.) (TCO)

35725 CENTRIFUGE CONTROL UNIT (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-1279).

1 drawing.

A centrifuge control box, which is mounted beneath the centrifuge, is fabricated of stainless steel and is 6 in. long, 5 in. high, and 4 in. deep. The front and rear panels are cork lined. The control circuit is included for the centrifuge motor. (For details, see TID-4100.) (TCO)

Radiation Detection

Refer also to abstracts 35357, 35450, 35633, 35709, 35795, 35949, 36137, and 36186.

35726 (AD-634718) DEVELOPMENT, TESTING, AND EVALUATION OF GERMANIUM NUCLEAR PARTICLE DETECTORS. Katzenstein, H. S.; Ziemba, F. P. (Solid State Radiations, Inc., Los Angeles, Calif.). June 1966. Contract DA-18-108-AMC-142(A). 116p. (NDL-TR-76). CFSTI $3.00 cy, $0.75 mn.

Results are presented of a study of some of the properties of thin-window germanium nuclear-particle detectors that were fabricated by use of the surface barrier lithium-ion-drift techniques. Emphasis was placed on the development of germanium-particle detectors that were suitable for application in the neutron spectrometer which employs the Li^6 sandwich technique. The study resulted in a fabrication procedure for the production of these devices, a preamplifier for germanium detectors, a cooling system for the germanium detectors, an improved electronic system, utilizing nanosecond electronics, for the Li^6 spectrometer, some general comparisons between silicon and germanium detectors, qualitative information on the fast-neutron-induced reaction in silicon and germanium and preliminary data on the response of a neutron spectrometer using thin-window silicon and germanium nuclear-particle detectors. The thin-window germanium detectors were fabricated by use of techniques similar to those employed in the corresponding silicon lithium-ion-drift detector. Although silicon detectors may be operated at room temperature, germanium detectors must be operated at reduced temperatures because of the large thermal-carrier generation rate in germanium at room temperature. Operation in contact with liquid nitrogen is the most suitable because of its general availability and ease of handling in the laboratory. The response of thin-window germanium detectors to charged particles is similar to that obtained with silicon devices, with the exception that the energy to form an electron-hold pair is about 1.26 times greater in silicon than in germanium. The gamma-ray response of germanium detectors is higher than that of silicon detectors since the efficiencies of the gamma-ray absorption processes increase with atomic number This property, as well as excellent energy resolution, has led to the use of germanium detectors in high-resolution photoelectric gamma-ray spectrometers. In contrast, the higher atomic number produces a larger Coulomb barrier against charged-particle emission, which is reflected in lower (n,p) and (n,α) cross sections. Thus, the background from neutron-induced reactions in germanium detectors is lower than that in silicon detectors. (auth)

35727 (AD-635169) A MULTIPLE DETECTOR SYSTEM ADAPTED FOR TOTAL ABSORPTION GAMMA-RAY SPECTROMETRY. Saccenti, John C.; Brady, Robert E.; McNeilly, John H. (Army Nuclear Defense Lab., Edgewood Arsenal, Md.). June 1966. 20p. (NDL-TM-30). CFSTI $1.00 cy, $0.50 mn.

A total absorption gamma spectrometer system utilizing

anticoincidence shielding is described. The multi-detector system consists of a 9.50-inch diameter, 10.0-inch high NaI(Tl) crystal annulus which serves as the anticoincidence guard. A 3.31-inch-diameter cylindrical cavity extends completely through, and is symmetric with, the crystal axis. Two additional NaI(Tl) crystals are positioned within the annulus cavity; one is removable for inserting samples. With the anticoincidence shielding, a factor of 6 reduction in the magnitude of the Compton portion of the cesium-137 spectrum can be achieved. For cobalt-60, the maximum reduction factor achievable is 25. For gamma energies less than 3 Mev, background is reduced by a factor of 3.3. Design flexibility permits coincidence, anticoincidence, and sum-coincidence operation. The system has effectively been used as an anticoincidence total absorption spectrometer, in coincidence for positron annihilation studies, and as an integral bias sum spectrometer. (auth)

35728 (AD-635209) DEVICES FOR DETECTING AND TRACING THE PATHS OF IONIZING PARTICLES. Hughes, Arthur L. (Washington Univ., St. Louis, Mo. Dept. of Physics). July 31, 1966. 8p. (AROD-3816:2). CFSTI $1.00 cy, $0.50 mn.

Spark chambers were used almost exclusively in connection with lightly ionizing particles such as those found in cosmic rays and in the particle beams produced by accelerators. Bright sparks, produced by lightly ionizing particles when their paths are inclined to the normal to the electrodes, are found almost always to take place along a normal to the electrodes, but under rather special conditions they are found to follow the path but only up to about 30°. In this investigation the performance of spark chambers traversed by heavily ionizing alpha particles from polonium-210 was studied. Bright sparks along the alpha particle tracks were readily obtained up to about 60° with the normal to the electrodes. The densely packed ion-pairs favor the overlapping of the electron avalanches, thereby making it possible for the spark to follow the particle up to wide angles. Experiments were made showing that the addition of 0.1 percent or less of SF_6 very greatly reduced the lifetime of the free electrons initiating the electron avalanches. (auth)

35729 (AD-635882) A TEMPERATURE COMPENSATING PREAMPLIFIER FOR DRIVING LONG COAXIAL LINES IN SCINTILLATION SPECTROSCOPY APPLICATIONS. Taylor, R. A.; Ehat, R. F. (Naval Radiological Defense Lab., San Francisco, Calif.). Feb. 11, 1966. 43p. (USNRDL-TR-1021). CFSTI $2.00 cy, $0.50 mn.

A temperature compensating transistorized, linear, unity gain preamplifier was designed and constructed for use as a coaxial cable line driver in a mobile gamma-ray scintillation spectrometry system. Its differential linearity was better than ±1% with input signals up to 3 volts when loaded with a terminated 93-ohm, 500-ft coaxial cable. The use of a simple thermistor temperature compensating network in the preamplifier of the detector-preamplifier package gave a system gain variation normalized at 25°C, as a function of temperature of less than +4% between 0°C and 25°C and less than −1% between 25°C and 50°C. (auth)

35730 (AECL-2569) PRELIMINARY TESTS ON ENCAPSULATED LITHIUM-DRIFT GERMANIUM GAMMA-RAY SPECTROMETERS MADE BY RCA VICTOR RESEARCH LABORATORIES, MONTREAL. Fowler, I. L.; Toone, R. J. (Atomic Energy of Canada Ltd., Chalk River (Ontario)). July 1964. 14p. (GPI-59). Dep. mn. AECL $0.50.

Tests were carried out on three encapsulated germanium lithium-drift γ-ray spectrometers. The detectors are approximately 2 cm^2 in area and 2 mm depletion (sensitive) depth and are encapsulated in modified standard steel transistor cans. After a straight-forward electrical clean-up procedure the detectors were cooled to liquid nitrogen temperature (77°K) and gamma spectra taken. All three detectors gave resolutions of 2.6 to 2.7 kev (fwhm) for 122-kev γ rays, and 6.3 kev for 1173-kev γ rays. The detectors were found to operate satisfactorily after storage for several days in a freezer at −22°C without further clean-up. One detector was operated, cooled to near 77°K with liquid nitrogen, in an insulated mount with no vacuum system. Such an arrangement is only possible with encapsulated detectors of this type and should prove convenient for many users for short-term experiments. Details of this non-vacuum mount are given. (auth)

35731 (AERE-M-1155) GAMMA DOSE-RATE ALARM SYSTEM. Maddock, J. E. (Atomic Energy Research Establishment, Harwell (England)). May 1966. 16p. Dep. BIS $0.70. HMSO 3s. 6d.

The design and performance of an installed gamma dose-rate alarm system which provides warning indication at any single pre-selected dose-rate within the range of 10 mR/h to 500 R/h, at a low cost relative to other currently available equipment are described. The system, which can operate from either battery or a-c mains supply, provides a visual indication showing whether the gamma dose-rate is below or above the preset warning level. Relay contacts are available for the operation of additional alarm-indicating devices. The equipment can function either as a single or multiple detector system and is designated Alarm Assembly A.E.R.E. Type 1796. (auth)

35732 (AERE-R-4246) AN ANTI-COINCIDENCE BETA SCINTILLATION COUNTER FOR LOW ACTIVITY SAMPLES. Waddingham, J. L.; Rowe, J. D. (Research Group, United Kingdom Atomic Energy Authority, Woolwich Outstation (England)). May 1966. 19p. Dep. BIS $0.60. HMSO 3s. 0d.

The source is placed in contact with a thin disc of plastic scintillator coupled to a 1 in. photomultiplier and the assembly is inserted inside a 2 in. well-type guard scintillator which has an associated 2 in. photomultiplier. The photomultipliers are connected in anti-coincidence. This counter has twice the efficiency for ^{90}Y, coupled with a lower background, than the MX 152 or GM4LB Geiger tubes employed in the normal anti-coincidence arrangement, and background reproducibility figures indicate a limit of detection (3σ) of 0.06 pCi for ^{90}Y in a forty-eight hour counting period. (auth)

35733 (AERE-R-5073) COMPTON SCATTERING SPECTROMETER. Brown, C. G. (Atomic Energy Research Establishment, Harwell (England)). May 1966. 24p. Dep. BIS $0.80. HMSO 4s.

A Compton scattering spectrometer is described which uses a silicon solid state detector as the primary gamma ray scatterer, and an array of NaI−Tl scintillation counters to detect the scattered gamma rays. The resolution achieved is 8 kev (FWHM) with an efficiency of 2.3×10^{-9} from a small source. It has the advantage that a single peak only is obtained for each gamma ray energy. Examples are given of complex spectra for ^{227}Ra, and a mixed fission product source. (auth)

35734 (AERE-R-5206) THE DEVELOPMENT AND APPLICATION OF Li-DRIFT GERMANIUM DIODES AT A.E.R.E. Gibbons, P. E. (Atomic Energy Research Establishment, Harwell (England)). May 1966. 24p. Dep. BIS $0.80. HMSO 4s.

A state-of-the-art account of detector fabrication and developments in cryostat design and low noise head amplifiers, using field effect transistors is presented. Present applications and future requirements are summarized. (auth)

35735 (AERE-R-5213) AN ATLAS COMPUTER PROGRAMME TO PRODUCE DIFFRACTOMETER CONTROL TAPES. Curry, N. A. (Atomic Energy Research Establishment, Harwell (England)). May 1966. 9p. Dep. BIS $0.30. HMSO 1s. 9d.

A description is given of a computer program written for ATLAS, which generates 5-hole punched paper tape to control Ferranti Mark II automatic diffractometers. Details of the format required for the input and the format of the tape which is produced are provided. (auth)

35736 (BMwF-FBK-65-07) BESTIMMUNG DER LONENDOSISLEISTUNG VERSCHIEDENER ELEKTRONEN-

STRAHLUNGEN FUER EICHZWECKE IN DER FLIMDOSIMETRIE. (Measurement of the Ion Dose Rate of Different Beta Rays for Purposes of Etalonation in the Film Dosimetry). Kallert, S. (Erlangen-Nuernberg Univ. (West Germany). Institut fuer Strahlenkunde). Dec. 1965. 57p. Dep. mn.

The determination of the ion dose of electron radiation was made for the purpose of calibration in film dosimetry. Different beta-ray emitters and a betatron were used as radiators. Three different methods which were independent of each other were used to determine the ion dose: by means of ionization chambers, scintillation spectrometers, and numerical evaluations. For this purpose especially suitable ionization chambers were constructed. The results obtained by the different methods agree sufficiently. (auth)

35737 (BMWF-FBK-65-08) FILMDOSIMETRIE VON β-STRAHLEN. (Film Dosimetry of β Rays). Kohlhof, Margherita (Erlangen-Nuerberg Univ. (West Germany). Institut fuer Strahlenkunde). Dec. 1965. 48p. Dep. mn.

The response of the Adox Dosis-Doppelfilm to β rays and electrons was studied. Photographic density graphs and sensitivity are reported. It is explained how to determine energy and dose from the density. Two methods to distinguish β rays and soft x rays are described: separation by backscattering (both kinds of radiation can be distinguished by means of their different degree of backscattering) and separation by absorption (Al- and Cu-filters of the same surface density (mass per unit area) absorb β rays equally, whereas x rays are more absorbed by Cu). Finally the dependence of the density on the angle of incidence of the radiation was investigated. (auth)

35738 (BNL-985) MEASUREMENT OF MEGARAD DOSES OF ^{60}Co GAMMA RAYS WITH ULTRAVIOLET-TRANSMITTING LUCITE. Muller, A. C.; Rizzo, F. X.; Mogk, R. B. (Brookhaven National Lab., Upton, N. Y.). Mar. 1966. Contract AT(30-2)-Gen-16. 9p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Commercially manufactured ultraviolet transmitting Lucite was evaluated as an integrating gamma dosimeter. Cobalt-60 gamma irradiation induces an ultraviolet absorbance in Lucite and this absorbance is directly proportional to absorbed dose in the range from 10^4 to 6×10^6 rads. After the proper corrections are made for bleaching and thickness, dosimetric measurements can be made with an expected precision of ±3%. (auth)

35739 (BNL-10326) SIMULATION TECHNIQUES APPLIED TO THE DESIGN OF THE 80-INCH LIQUID HYDROGEN BUBBLE CHAMBER EXPANSION SYSTEM. Goodzeit, C. L. (Brookhaven National Lab., Upton, N. Y.). June 1966. Contract AT(30-2)-Gen-16. 21p. (CONF-660631-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Scientific Computing Symposium, Yorktown Heights, N. Y.

During the design phase of BNL's 80-inch Liquid Hydrogen Bubble Chamber Project, a study was made of a nonlinear dynamic system that was programmed for operation on a digital computer. The theoretical technique for analyzing the expansion system of the bubble chamber is outlined. (M.O.W.)

35740 (BNWL-SA-516) NEUTRON DOSIMETRY USING THE FISSION FRAGMENT DAMAGE PRINCIPLE. Baumgartner, W. V.; Brackenbush, L. W. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). June 9, 1966. Contract AT(45-1)-1830. 17p. (CONF-660621-2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Health Physics Society, 11th Annual Meeting, Houston, Tex.

Plastics, glasses, and minerals used in conjunction with fissionable foils provide the basis for a full energy spectrum neutron dosimeter. Theoretical and experimental studies indicate that fast neutron doses as low as 100 mrem and thermal neutron doses of 1 mrem can be measured. Solid state nuclear track detectors were fabricated with fission foils of metallic U-235 (93%) and 20-fold depleted U-238. Neptunium oxide foils were fabricated using slow-curing polyester resin as a support base. Uniform surfaces of neptunium oxide were obtained that contained approximately 35 mg/cm^2 of neptunium. Exposure studies of RaBe, PuBe and PuF_4 neutron sources and monoenergetic fast neutrons obtained from a 2 Mev positive ion accelerator characterized the energy and dose response of this device. Comparison studies using solid state nuclear track detectors and NTA emulsions were made in field exposure situations. The solid state nuclear track detectors permitted dose evaluation in several neutron energy groups in mixed gamma and neutron radiation fields. This new dosimeter principle used with a single Np-237 foil will provide substantially improved neutron dosimetry in mixed radiation fields compared to the commonly-used NTA emulsion dosimeters. (auth)

35741 (CEA-R-2950) ETUDE ET REALISATION D'UN SPECTROMETRE BETA MULTIVOIES A CHAMP MAGNETIQUE UNIFORME. (Study and Construction of a Multichannel Beta Spectrometer with Uniform Magnetic Field). Schussler, Francois (Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires). Sept. 24, 1965. 55p. Dep. mn.

Thesis. Submitted to Grenoble Univ. (France). Faculte des Sciences.

After a brief survey of the interest of a multichannel beta spectrometer for studying decay schemes of short lived nuclides (30 seconds minimum), the theoretically well known characteristics of uniform magnetic field analyzer, image of a large source, and transmission and resolution are briefly discussed. The apparatus built as a result of these calculations is described. This apparatus allows the determination of beta spectra by simultaneous determination of the beta spectra in coincidence with four gamma rays predetermined in the gamma spectrum of the studied nuclide. Finally, the experimental characteristics of the spectrometer calibration in energy and transmission and the first measurement of beta spectra (^{155}Sm) and of coincidences (^{24}Na), are given. (auth)

35742 (CEA-R-2991) TRAITEMENT DES INFORMATIONS ISSUES D'UN SPECTROMETRE γ. (Processing of Data Issued from a Gamma Spectrometer). Boulanger, Jean-Pierre (Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires). Mar. 1966. 56p. Dep. mn.

A study was made of computation methods applied to analysis by gamma spectrometry. An investigation was made of quantitative analysis by the least-squares method, improved by a gain-shift correction. Then the single full-energy peaks and the resolution of complex peaks are dealt with. In both cases, the calculation principle, then the systematic tests realized in order to prove their validity and determine their application ranges are described and finally some experimental results appropriate to illustrate their possibilities are presented. (auth)

35743 (CLOR-46/D) ABSOLUTE METHOD OF THE GAMMA-RAY BACKGROUND DETERMINATION BY MEANS OF NaI(Tl) SCINTILLATION COUNTER. Pensko, J. (Centraline Laboratorium Ochrony Radiologicznej, Warsaw (Poland)). 1966. 22p. Dep. mn.

An absolute method for the dose rate measurements of the gamma-ray natural background by means of the NaI (Tl) scintillation counter is presented. The calibration factor was determined taking into account the angular response of the counter, energy response, the response of the counter to natural beta and cosmic radiation and the radioactive pollution of constructing materials. This method makes possible the determination of the global gamma dose rate originating from natural and artificial and from nuclear explosion background with the overall error not exceeding ±7.5 per cent. The stability of the lower discrimination level 300 kev was kept better than ±5 per cent. (auth)

35744 (DP-MS-66-29) DEVELOPMENT AND APPLICATIONS OF THERMOLUMINESCENT DOSIMETERS.

Hall, R. M. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). May 25, 1966. Contract AT(07-2)-1. 16p. (CONF-660623-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Medical Physics, Madison, Wis.

Thermoluminescent dosimeters are being developed at the Savannah River Laboratory for various research programs, environmental surveillance, and personnel monitoring. The upper range of LiF dosimeters was extended to 10^8 R by using a secondary glow peak between 270 and 350°C. From 10 to 10^8 R, the primary glow peak (between 25 and 270°C) and the secondary peak can be used to obtain duplicate results from each dosimeter. With single LiF crystals, exposures as low as 1 mR are measured with an accuracy of ±15% (at the 95% confidence level). Laboratory and field tests showed that thermoluminescent dosimeters were more accurate, reliable, and economical than instruments used previously for measuring environmental radiation. Fading (loss of thermally stimulated luminescence) was found to be primarily due to exposure to sunlight. Laboratory tests indicated LiF faded 13% in 12 days and 21% in 45 days when illuminated by simulated sunlight at 2.5×10^3 foot-candles for 10 hours per day. Dosimeters stored in opaque containers at outdoor stations had faded 4% after one month and 20% after one year. Humidity did not affect response. Thin single crystals (~0.1 mm) or a layer of LiF powder (20 mg/cm^2) have the same response for radium gamma and beta radiation over a range of maximum energies, (0.7 to 2.2 Mev). Rings fabricated from 3 mil polyethylene containing a thin layer of LiF are used to measure hand dose. Capsules containing LiF powder were used at the Medical College of Georgia to measure the radiation doses received during cancer therapy. These small dosimeters accurately measured the dose to the tumor or adjacent tissue. They are also used to measure the dose distribution in tissue equivalent material from new radioactive sources proposed for radiotherapy. (auth)

35745 (EUR-2985.e) RDMM: A CODE FOR FAST NEUTRON SPECTRA DETERMINATION BY ACTIVATION ANALYSIS. Di Cola, G.; Rota, A. (European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center). June 1966. 32p. Dep. mn.

A FORTRAN code RDMM (Relative Deviation Minimization Method) is described. The code allows the automatic interpretation of the activation data for in-pile fast neutron spectra determination. (auth)

35746 (IEA-108) UNE NOUVELLE METHODE D'UTILISATION DES CRISTAUX DE NaI(Tl) DANS LA DETECTION DE RAYONS GAMMA DE HAUTE ENERGIE. (New Method of Utilization of NaI(Tl) Crystals in Detection of High-Energy Gamma Rays). de Abreu, Manoel Americo Nogueira; Nifenecker, J. H. (Instituto de Energia Atomica, Sao Paulo (Brazil)). Dec. 1965. 26p. Dep. mn.

The detection of high energy gamma rays (E > 2 Mev) with NaI(Tl) crystals is very complex due to the fact that one or two gamma rays of 511 Kev, from pair annihilation, or the primary gamma ray, after Compton scattering, can escape from the crystal. If only the gamma rays that lose a great part of their energy in the central region of the crystal are observed, assuming that the partial interaction occur mainly at the crystal surface, only gamma rays losing their whole energy in the crystal, will be detected. Theoretical considerations for the detection of high energy gamma rays, taking into account the shape of the spectrum and its efficiency are presented with the experimental data. (auth)

35747 (IEA-114) ABSOLUTE MEASUREMENTS OF THE ACTIVITY OF RADIONUCLIDES. I. THE DEFINED SOLID-ANGLE METHOD WITH GEIGER-MUELLER COUNTERS. Reis, Dagmar C. C.; de Moura, Lais P. (Instituto de Energia Atomica, Sao Paulo (Brazil)). Dec. 1965. 32p. Dep. mn.

A detailed account of the defined solid angle method with Geiger Müller counters is presented. A system is described in which both the geometry and dead time are defined independently of the counter and the influence of the different factors which affect the overall efficiency is analyzed. Because of its reliability and simplicity the method is largely used for routine measurements, in spite of its limited precision. (auth)

35748 (INP-457/PL) AUTOMATION OF THE MOESSBAUER SPECTROMETER. Bara, J.; Janicki, M. (Institute of Nuclear Physics, Krakow (Poland)). Feb. 1966. 5p. Dep.

A prototype system was elaborated for automatic measurement of the Mössbauer spectra in the velocity range 0-10 mm/sec. This system changes the velocity of the absorber step by step, and records the number of pulses, the time of measurement, and the values of the velocity. The velocity intervals and number of pulses for each point of measurement can be programmed. (auth)

35749 (ISS-66/11) SAN 64: UN PROGRAMMA PER LA RICOSTRUZIONE SPAZIALE DI EVENTI IN CAMERA A DIFFUSIONE CON DUE VISTE. PARTE I. DESCRIZIONE GENERALE. (SAN 64: Program for Spatial Reconstruction of Events in a Two-View Diffusion Chamber. Part I. General Description). Salvadori, P. (Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica). Mar. 14, 1966. 66p. Dep. mn.

SAN 64 is a program for the IBM 7040 computer useful in analyzing events occurring in a two-view diffusion chamber. The first part describes the program explaining the formulas and giving instructions for it. The second part contains the figures related to the description of the program. The third part presents the block-diagrams with which the program instructions can be followed step by step. In the fourth part the complete listing of the Main Program with its 11 Subroutine is printed. (auth)

35750 (ISS-66/12) SAN 64: UN PROGRAMMA PER LA RICOSTRUZIONE SPAZIALE DI EVENTI IN CAMERA A DIFFUSIONE CON DUE VISTE. PARTE II. FIGURE. (SAN 64: Program for Spatial Reconstruction of Events in a Two-View Diffusion Chamber. Part II. Figures). Salvadori, P. (Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica). Mar. 14, 1966. 29p. Dep. mn.

35751 (ISS-66/13) SAN 64: UN PROGRAMMA PER LA RICOSTRUZIONE SPAZIALE DI EVENTI IN CAMERA A DIFFUSIONE CON DUE VISTE. PARTE III. SCHEMI A BLOCCHI. (SAN 64: Program for Spatial Reconstruction of Events in a Two-View Diffusion Chamber. Part III. Block Diagrams). Salvadori, P. (Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica). Mar. 14, 1966. 54p. Dep. mn.

35752 (ISS-66/14) SAN 64: UN PROGRAMMA PER LA RICOSTRUZIONE SPAZIALE DI EVENTI IN CAMERA A DIFFUSIONE CON DUE VISTE. PARTE IV. LISTA DELLA ISTRUZIONI. (SAN 64: Program for Spatial Reconstruction of Events in a Two-View Diffusion Chamber. Part IV. List of Instructions). Salvadori, P. (Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica). Mar. 14, 1966. 44p. Dep. mn.

35753 (JINR-P-2707) ISSLEDOVANIE PARAMETROV DVUKH TIPOV SISTEM STABILIZATSII SPEKTROMETROV. (Investigation of Parameters of Two Types of Spectrometer Stabilization Systems). Prikhod'ko, V. I.; Tishin, V. G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1966. 19p. Dep. mn.

Two types of spectrometer stabilization systems which are used for precise measurements of pulse-height spectra are considered. The effect of the parameters of such systems on the basic spectrometer characteristics (rate of setting equilibrium with changes in threshold or gain, broadening of the peaks in the spectrum, and shifts in the peaks as a function of linearly changing drifts) is estimated. Results are presented of the experimental investigation of the two types of stabilization systems. (auth)

35754 (JINR-P-2727) METODIKA YUSTIROVKI STEREOFOTOAPPARATOV. (Methods of Stereoscopic Camera Adjustment). Andreev, E. M.; Libman, G.; Seli-

vanov, G. I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1966. 12p. Dep. mn.

The procedure of stereoscopic camera adjustment for a bubble chamber is described. The criteria are given which determine the constructive elements of some arrangements as well as the ways of eliminating errors which are due to the inaccuracy in the manufacturing of the mechanical assemblies. (auth)

35755 (LA–3498) THE SILVER COUNTER: A DETECTOR FOR BURSTS OF NEUTRONS. Lanter, Robert J.; Bannerman, Daniel E. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). Apr. 1966. Contract W-7405-eng-36. 36p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The silver counter uses a detector consisting of G-M tubes and silver foils in a polyethylene moderator. It measures the beta decay of silver activated by neutrons. The count obtained in a 1-min interval immediately following the burst of neutrons indicates the number of neutrons. Graphs of calibration factors as functions of source-to-counter distances are given. The sensitivity to 14-Mev neutrons is one count per 5000 neutrons from a source 12.8 cm from the detector. For 2.4-Mev neutrons, the sensitivity is one count per 2200 neutrons at 12.8 cm. The background rate is approximately 200 cpm. (auth)

35756 (LA-DC–7702) RESPONSE OF SELECTED NEUTRON MONITORING INSTRUMENTS TO SEVERAL TYPES OF NEUTRON SOURCES. Hankins, Dale E. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [1965]. Contract W-7405-eng-36. 21p. (CONF-660621–5). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Health Physics Society, 11th Annual Meeting, Houston, Tex.

The response of several neutron-monitoring instruments to nine neutron sources are compared and it is concluded that differences in the neutron spectra of the sources and differences in the energy dependence of the instruments significantly affect calibration results. Neutron sources of ^{238}PuBe, ^{239}PuBe, AmBe, PoBe, RaBe, and spontaneous fissioning ^{244}Cm were used. (B.G.D.)

35757 (PAEC(A)IN–658) SEMICONDUCTOR DETECTORS. A Literature Search. (Philippine Atomic Energy Commission, Manila). Aug. 1965. 54p. Dep. mn.

A bibliography is presented on semiconductor detectors. The entries are listed under the subject headings of biology and medicine, engineering, health and safety, instrumentation, reactor technology, and physics. (B.G.D.)

35758 (PG-Report-711) THE APPLICATION OF CONDENSED-STATE TECHNIQUES TO NEUTRON DOSIMETRY. Watt, D. E. (Production Group, United Kingdom Atomic Energy Authority, Annon (Scotland)). [1966]. 22p. (CONF-660219–1). Dep. BIS $0.80. HMSO 4s. 0d.

From Society for Radiological Protection, Symposium on Dose Measurement Techniques under Development, London.

There are three general approaches to dose measurement in a neutron radiation field. A review of the various types of solid and liquid neutron dosimeters under development is presented. The application and range of sensitivity within the three general categories are considered and summarized in a table. A full list of references to relevant work is provided. (auth)

35759 (RT-EL–(66)2) AUTOMATIC SYSTEMS APPLIED TO NEUTRON SPECTROMETRY. Bevilacqua, S.; de Agostino, E.; Rispoli, B. (Comitato Nazionale per l'Energia Nucleare, Rome (Italy)). 1966. 7p. Dep. mn.

An analysis of different solutions adopted for automatic control systems of neutron spectrometry is presented. The criteria from which control systems were designed is discussed. (B.G.D.)

35760 (SC-TM–66-232) A HYBRID THIN-FILM CIRCUIT BUCKET AND LADLE COUNTER. Whitford, R. E.; Dugan, Virgil L. (Sandia Corp., Albuquerque, N. Mex.). June 1966. Contract AT(29-1)-789. 16p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A bucket and ladle counting circuit, conventionally made by mounting discrete components on a printed circuit board, was made in the form of a hybrid thin-film package to gain advantages in size, weight, and reliability over the printed circuit package. The hybrid thin-film circuit design and fabrication are described and comparisons between the printed circuit and thin-film packages are made. (auth)

35761 (STI-PUB–21-18) NEUTRON DETECTORS. Bibliographical Series No. 18. (International Atomic Energy Agency, Vienna (Austria)). 1966. 409p. IAEA: $8.00; S168,-; pound 2.2.0; F Fr 32,-; DM 28,-.

1989 references are presented in a bibliography on neutron detectors. The source material was taken from books, periodicals, reports, and abstracting journals. (B.G.D.)

35762 (TID–22937) OPTICAL DESIGN OF TEST STRIP PERISCOPE FOR HYDROGEN BUBBLE CHAMBER. Final Report. (Tropel, Inc., Fairport, N. Y.). Dec. 2, 1965. Contract W-31-109-eng-38. 15p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

For Argonne National Lab., Ill.

The development of a preliminary periscope design adapted to a reflecting object is reported. (B.G.D.)

35763 (TID–22971, pp 141-83) EXPERIMENTAL INSTRUMENTATION. (Minnesota Univ., Minneapolis. Linear Accelerator and Tandem Van de Graaff Lab.).

Experimental instrumentation for the Linear Accelerator and Tandem Van de Graaff Laboratory are described. (B.G.D.)

35764 (UCRL–16869) SOLID-STATE COUNTERS FOR IMMEDIATE ANALYSIS DURING COLUMN CHEMISTRY. Haley, James T.; Walker, Robert J.; Corbin, Tommy R. (Lawrence Radiation Lab., Univ. of California, Berkeley). May 12, 1966. Contract W-7405-eng-48. 11p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A reliable method, using solid-state detectors, is described for the immediate determination of actinide and lanthanide elution peak positions during separation of transplutonium elements and rare earths. (auth)

35765 (AD–630996) A UNIFIED MULTICHANNEL TELEMETERING SYSTEM FOR THE STUDY OF NUCLEAR RADIATIONS. Bragin, A. A.; Fedoriv, R. F. Translated from Vop. Peredachi Inform., 3: 118-21(1964). 7p. (FTD-TT–65-1889). CFSTI $1.00 cy, $0.50 mn. JCL $1.10 fs, $0.80 mf.

The possibility of constructing a unified multichannel telemetering system which can transmit measurements of different types of radiations that have different intensities from remote locations is discussed. (B.G.D.)

35766 SCINTILLATION COUNTING. Lenihan, J. M. A. (Regional Physics Dept., Glasgow). pp 13-18 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

A brief history of radiation detection instruments is presented with an elementary discussion on the principle of operation of a scintillation counter. Phosphor materials are considered. Gamma reactions with phosphors by Compton absorption, pair production, and photoelectric absorption are discussed. (P.C.S.)

35767 DETECTION OF RADIOACTIVITY. Gibbons, D. (United Kingdom Atomic Energy Authority, Wantage, Eng.); Wainerdi, R. E. pp 19-25 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Detection of β particles and positrons at 0.5 to 3 Mev, x rays at 1 kev, γ rays at 0.1 to 3 Mev, α particles (limited number of applications), and neutrons with energies up to around 14 Mev is discussed. Advantages and disadvantages of gas ionization methods, scintillation counters, solid-state detectors, surface-barrier detectors, and neutron spectrometers are given. (P.C.S.)

35768 FACTORS AFFECTING THE ACCURACY OF ASSAY. Wilson, H. W. (Scottish Research Reactor Center, East Kolbride, Glasgow). pp 91-6 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

The effects of statistical fluctuations in the number of counts, background and counter efficiency, dead time, counter geometry, absorption, and back scattering are discussed as factors affecting the accuracy of radioactivity measurements. (P.C.S.)

35769 EXPERIMENTAL MEASUREMENT OF THE MAGNETIC FIELD OF A BUBBLE CHAMBER. Senent, F.; Pardo, G.; Castellote, V.; Gil. G. An. Real Soc. Espan. Fis. Quim. (Madrid), Ser. A, 62: 177-9(May-June 1966). (In Spanish).

A method for measuring the magnetic field of a bubble chamber, which is based on the field experienced by antiprotons at rest, is outlined. The method makes use of the Senent and Gil trajectories method. (C.E.S.)

35770 CONSTRUCTION OF FORM OF UNIVERSAL TRAJECTORY FOR CHARGED PARTICLES IN A BUBBLE CHAMBER. Senent, F.; Gil, G.; Pardo, G.; Castellote, V. (Facultad de Ciencias, Valladolid, Spain). An. Real Soc. Espan. Fis. Quim. (Madrid), Ser. A, 62: 181-5(May-June 1966). (In Spanish).

A method is outlined for constructing a "universal trajectory" for bubble chambers. Using this method, one is able to determine the track of any particle in a bubble chamber by multiplying the universal trajectory values by the mass and trajectory dip angle of the particle considered. (C.E.S.)

35771 SCINTILLATION DETECTION OF NUCLEAR RADIATION: PRESENT PRODUCTION, STUDIES AND PROSPECTS. Van Rooy, J. Bull. Inform Sci. Tech. (Paris), No. 104, Suppl., 7-10(May 1966). (In French).

The recent improvements in scintillation detection instruments are briefly indicated. These include the scintibloc in improved mounting, detectors with auxiliary source for spectrum stabilization, and low self-movement crystals. (J.S.R.)

35772 TECHNICAL INNOVATIONS IN THE AREA OF PHOTOMULTIPLIERS. Petit, R. Bull. Inform. Sci. Tech. (Paris), No. 104, Suppl., 11-16(May 1966). (In French).

Technical innovations in the material of photomultipliers are reviewed. The recent developments in photocathodes are considered, and new types of cathodes with high sensitivity, high gain, and a weak obscurity current are described. These include strengthened photomultipliers, photomultipliers with very low background, photomultipliers stable for spectrometry, fast photomultipliers, and fast photomultipliers with a wide range of linearity. (tr-auth)

35773 PRESENT STATUS AND PROSPECTS FOR SEMICONDUCTOR RADIATION DETECTORS. Fertin, J. Bull. Inform. Sci. Tech. (Paris), No. 104, Suppl., 17-25 (May 1966). (In French).

A brief review is given of the effect of electromagnetic radiation with emphasis on the semiconductor crystals. The general characteristics of junction detectors are defined. The different types of semiconductor detectors discussed are diffuse-junction detectors, neutron detectors, surface-barrier detectors, lithium-compensated silicon detectors, and lithium-compensated germanium. New areas in which semiconductors detectors can be used are tabulated. (J.S.R.)

35774 RECENT EVOLUTION AND PROSPECTS IN THE AREA OF MULTICHANNEL ANALYZERS AND MULTIPARAMETRIC ANALYSIS CHAINS. Benoit, A. Bull. Inform. Sci. Tech. (Paris), No. 104, Suppl., 26-9(May 1966). (In French).

A brief review is given of the recent developments and possible future developments with respect to multichannel analyzers and multiparametric analysis chains. (J.S.R.)

35775 RECENT DEVELOPMENTS AND PROSPECTS IN MEASUREMENT OF LOW AND MEDIUM β AND α RADIOACTIVITITIES. Benoit, A. Bull. Inform. Sci. Tech. (Paris), No. 104, Suppl., 30-4(May 1966). (In French).

Gas flow counters for the measurement of low α and β activities and special radiation detection devices are described. The associated electronics and special developments are indicated. (J.S.R.)

35776 POCKET-SIZE, SIGNALING, RADIATION DOSEMETER. Brown, D. P. (Battelle-Northwest, Richland, Wash.). Contract AT(45-1)-1350. Health Phys., 12: 943-7(July 1966).

A personally-carried, miniature, signaling radiation dosimeter, which employs a recharging type of ionization chamber as a sensor, has been developed. The dosimeter provides an audible signal following the accumulation of a predetermined dose, typically 100 mR. Solid state circuits were developed along with a method of charging the center rod of the pencil type ionization chamber prior to use. Several experimental dosimeters were assembled and tested with promising results. Testing indicated that alarm signal activation repeatability values of ±10% of the preselected dose were obtained. A mechanical adjustment within the chamber can provide dose value alarm trip points as desired. Each experimental dosimeter weighs about 8 oz and can easily fit into a standard shirt pocket. (auth)

35777 PHOTOGRAPHIC, GLASS, OR THERMOLUMINESCENCE DOSIMETRY. Becker, K. (Juelich Nuclear Research Establishment, Ger.). Health Phys., 12: 955-64(July 1966).

An attempt is made to compare advantages and disadvantages of classical photographic and modern solid-state detectors. Both advanced thermoluminescent detectors (TLD), in particular LiF and similar materials, and more recent radiophotoluminescent glasses are superior to photographic systems with regard to reliability and accuracy of the dose indication, sensitivity, dose range, energy and directional dependence of sensitivity, fading and fogging stability, reusability, fast and cheap evaluation, etc. LiF seems to be superior for certain radiobiological and medical purposes because of its flat response. For routine and accident (military or civil defense) personnel dosimetry, however, a properly designed glass badge gives more information and is a remeasurable document of the exposure similar to the photographic film because the radiation effect is integrated in spite of an unlimited number of interval measurements. As an example of a possible next generation personnel dosimeter, proposals for a multiglass badge are briefly described. It is capable to give instant information about the gamma and beta dose, the average gamma energy and the presence of neutrons. Fast neutrons can be measured by automatic counting of the number of fission fragment tracks in glass or other nonphotographic nuclear track detectors. Some practical aspects of this system are discussed. (auth)

35778 UTILIZATION OF BORON-LOADED NUCLEAR TRACK PLATES IN A SPHERICAL MODERATOR FOR MEASURING ENVIRONMENTAL NEUTRON DOSE. Vives, M.; Shapiro, J. (Harvard School of Public Health, Boston). Health Phys., 12: 965-7(July 1966).

An environmental neutron dosimeter was prepared that utilizes a 5-l spherical pyrex flask filled with water as the moderator with boron-loaded nuclear track plates (Ilford type K-1) suspended into the middle. The nuclear emulsions were 50 μ thick. The emulsions were exposed to varying neutron doses from a Pu-Be neutron source and the number of tracks counted was consistently proportional to the neutron dose. Alpha tracks and proton tracks were easily recognized and excluded. The dosimeter gave good agreement with measurements made simultaneously using a LiI scintillation detector and the dosimeter was found to have a low sensitivity to γ radiation. It was concluded that the dosimeter will give excellent results for measuring neutrons in the presence of γ radiation of up to 10 R. (C.H.)

35779 SCHEME FOR HIGH-LUMINOSITY HIGH-RESOLUTION INTERNAL AND EXTERNAL CONVERSION MEASUREMENTS. Bergkvist, Karl-Erik (Research

Inst. for Physics, Stockholm). pp 107-24 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

Some ways by which the level of resolution normally used in β spectroscopy could be increased by about a factor of ten without reducing the counting rate or introducing any higher demands on either the absolute or the specific activity of the sample under investigation are considered. The principles and basic design and performance are considered. Also a method for the reduction of Compton background of external conversion measurements is given. (J.F.P.)

35780 APPLICATION OF THE INTERNAL-EXTERNAL CONVERSION (IEC) METHOD TO THE LENS-TYPE SPECTROMETER. Hultberg, Soelve; Bartlett, Albert A. (Nobel Inst. of Physics, Stockholm). pp 141-53 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A solution for the problem of the ring-shaped entrance aperture in lens-type spectrometers is presented, and the f-factor analysis of beta-spectrometrically recorded photolines for evaluating relative gamma intensities for lens spectrometers is described. The aperture correction, the source-converter-aperture geometry, f-factor calculation, and experiments and results are discussed. Also the BESK program SHB for f-factor calculation is mentioned. (J.F.P.)

35781 IEC METHOD APPLIED TO A MEDIUM-THIN MAGNETIC LENS SPECTROMETER. Feuerbacher, J. L.; Zganjar, E. F.; Hamilton, J. H. (Vanderbilt Univ., Nashville). pp 155-8 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The general applicability of the internal-external conversion method of determining conversion coefficients is verified for lens spectrometers. The f-factor calculations were tested for a medium-thin lens spectrometer having a mean emission angle of 15° using the K-conversion coefficient of the 662-kev transition in ^{137}Ba. It is shown that for different types of lens spectrometers conversion coefficients can be measured with an accuracy of better than 10% which is sufficient for most work. (J.F.P.)

35782 IMPROVEMENT OF THE RESOLUTION OF A SIEGBAHN-SVARTHOLM TYPE IRON-YOKE DOUBLE-FOCUSING SPECTROMETER. Suter, T.; Moragues, J.; Reyes-Suter, P.; Scheuer, W. (Comision Nacional de Energia Atomica, Buenos Aires). pp 159-62 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The improvement of the focusing conditions for the Siegvahn-Svartholm double-focusing iron-yoke beta spectrometer is described. From the resulting curves for the corrected and uncorrected spectrometer it is concluded that for high resolving power settings a gain of a factor of 2 or more is obtained for the same transmission. (J.F.P.)

35783 $\pi\sqrt{13}/2$ HIGH-PRECISION β-RAY SPECTROMETER. Daniel, H.; Jahn, P.; Kuntze, M.; Spannagel, G. (Max Planck Inst. of Nuclear Physics, Heidelberg). pp 399-404 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A beta spectrometer which combines very high resolution with high transmission is described. This instrument belongs to the class of flat spectrometers and has no axial focus at the exit slit which is curved. A perspective drawing of some electron orbits and the coil arrangement are shown. Also spectra from the active Th deposit and conversion lines of the 238.6-kev line in ^{212}Bi found by using this instrument are shown. (J.F.P.)

35784 SIMPLE METHODS OF ANALYZING UNKNOWN BETA EMITTERS. Loessner, V. (Staatliche Zentrale fuer Strahlenschutz, Berlin). Kernenergie, 9: 153-9(May 1966). (In German).

Methods used for determining the maximum energy E_0 of beta particles for the identification of beta-emitting nuclides are discussed according to the following types: range measurements; measurements of absorption coefficient; measurements of backscattering intensity; and pulse height discrimination techniques. (60 references) (L.B.S.)

35785 FABRICATION OF LITHIUM-DRIFTED GERMANIUM PIN DETECTORS FOR HIGH-RESOLUTION GAMMA SPECTROSCOPY. Ruge, I.; Eichinger, P.; Koepp, F. (Technische Hochschule, Munich). Kerntechnik, 8: 297-300(July 1966). (In German).

The principle of the lithium-drift is given and the germanium-lithium system is described. The drift procedures are outlined with emphasis on the difficulties of preparation. A method for the preparation of germanium p-i-n detectors for γ spectroscopy is given. (J.S.R.)

35786 DOSIMETRY WITH SCINTILLATOR SPECTACLES. Reiser, W. (Justus Liebig-Univ., Giessen, Ger.). Kerntechnik, 8: 301-2(July 1966). (In German).

Some considerations and preliminary research made in reference to dosimetry in the case of a nuclear catastrophe are reported. The conditions that must be fulfilled by a dosimeter for populations are outlined. The utility of various scintillators as dosimeters for the general population is considered on the basis of an exposure rate of 100mR/hr. The results showed that scintillator spectacles for dosimetry are feasible. (J.S.R.)

35787 KARLSRUHE PRECISION CRYSTAL SPECTROMETER FOR NEUTRONS. Albold, E. (Kernforschungszentrum, Karlsruhe, Ger.). Kerntechnik, 8: 309-14(July 1966). (In German).

The design, construction, auxiliary devices, and control circuits of the Karlsruhe crystal spectrometer for neutrons are described. Typical measurement curves are given as illustration. (J.S.R.)

35788 HOW TO SHIELD A BF_3 COUNTER. Koehler, W.; Knopf, K. (Technische Hochschule, Munich). Kerntechnik, 8: 319-21(July 1966). (In German).

The necessity of shielding BF_3 counters is considered and studies on the reduction of the counting rate of the neutron background by various shields are reported. Some of the measurements were made in the reactor hall with steel tube shields. Measurements with aqueous solutions were made using a neutron source. Shielding materials of B_4C, B_2O_3, H_3BO_3, paraffin, and Cd were studied. The results are tabulated and show that the most suitable material for BF_3 counters is a ^{10}B shield if only a very small space is available and a cladding of B_4C when more space is available. (J.S.R.)

35789 CONTROL OVER CONDITIONS GOVERNING MEASUREMENT OF LOW ACTIVITY LEVELS. Malykhin, V. M. (Scientific Research Inst., Leningrad). Med. Radiol., 11: No. 1, 78-81(Jan. 1966). (In Russian).

Uncontrolled changes such as a change in counting efficiency, a shift in the discrimination threshold, or the appearance of spurious pulses from electrical irregularities require that tests be made on the counting stability, especially when counting must be carried out over a long period of time. The counting stability is verified by noting the counting time to count a given number of disintegrations. The distribution of time intervals to count a given number of pulses can be compared with the theoretical distribution for a stable system by the use of statistics. Rules are given for the elimination of any one subinterval of time due to an anomalous count. (TTT)

35790 ANALYSIS OF FAST NEUTRON POPULATIONS BY OBSERVATION OF PROTONS PROJECTED IN IONOGRAPHIC EMULSIONS. Beets, C. Mem. Soc. Roy. Sci. Liege, 13: No. 3, 1-146(1966). (In French).

The measurements of the distribution as a function of energy of the fast reactor neutrons by the ionographic emulsion technique was analyzed. This technique was applied to the determination of the spectra at the interior of a cell of the BR1 reactor. A critical examination of the technique was made and a method for the processing of

the results was adopted. The response of ionographic emulsions with fine grains was determined. The results obtained for two representative spectra of fast neutron population existing in reactors are presented. The two spectra examined are the fission neutron spectra of ^{235}U induced by thermal neutrons and the equilibrium spectra in a natural uranium block one of whose faces was irradiated with thermal neutrons. In a complementary study the preparation of an emulsion with ultrafine grains and the improvement of observation and scanning methods were investigated. The results are discussed in some detail. (J.S.R.)

35791 SOME SCINTILLATION CHARACTERISTICS OF UNACTIVATED CsI AT ROOM TEMPERATURE. Langkau, R. (Institut fuer Experimentalphysik, Hamburg). Z. Naturforsch., 21a: 470-4(Apr. 1966). (In German).

By means of a sampling-storage method, the time behavior of the scintillation of an unactivated CsI crystal was investigated at room temperature. Alpha particles and γ quanta were used for excitation of the scintillations. The pattern is composed of a fast and slow component, and the intensity ratio of both components is very strongly dependent on the type of exciting radiation. This fact can be used for particle discrimination. (tr-auth)

35792 SOLID STATE ALPHA COUNTER FOR CHEMICAL STREAMS /Q-2761/ (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-1397).

1 drawing.

The counter monitors α activity in liquid streams containing LiCl. Bias switching is accomplished electronically rather than by a motor-driven mechanical switch to prevent the diode α detector which is exposed to the stream from becoming anodized. A high-gain amplifier is used, and the discriminator is gated out while the detector is forward-biased. A transistor is used as a pulsed current source permitting the resistance in the integrating circuit to be increased by a factor of 20 and reducing the capacitance leakage current. The counting rate approaches 10^5 counts/sec. The count-rate meter has full-scale ranges of 10, 100, 1000, 10^4, and 10^5 counts/sec. The full-scale departure from linearity will not exceed 1.5%. The full-scale counting loss for random pulses is 2% on all ranges, except for the 10^5 count/sec range where the counting loss is 20%. (For details, see TID-4100.) (TCO)

35793 GAMMA BACKGROUND MONITOR /Q-2718/ (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-1396).

1 drawing.

The monitor consists of a G-M tube, a blocking-oscillator high voltage supply, a trigger pair, and an emitter follower. The monitor will transmit 6-v 20-μ sec pulses over 3 miles of lamp cord or 75 Ω cable. The line also carries d-c power (25 to 30 v at 12 to 18 ma) for the remote monitor. The signal is adequate for any transistorized count rate meter. The monitor is packaged in a round gasketed can $1\frac{1}{4}$ in. high and 5 in. in dia. (For details, see TID-4100.) (TCO)

35794 ALPHA, BETA, OR GAMMA COUNTER FOR MEDICAL USE /Q-2739/ (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-1390).

1 drawing.

An instrument was designed to check for skin or wound contamination. The instrument requires no warmup period and has no high-voltage, gain, or discriminator controls to adjust. A single count-rate meter and a single decade scaler provide readout, and variable-frequency audio oscillator provides a frequency-modulated tone. The instrument has solid-state circuitry. The count-rate meter has full-scale ranges of 100, 1000, 10,000, and 100,000 c/min with an accuracy of 2%. The decade scaler has a scale factor of 100 and a paired-pulse resolution of 4 μsec. The α detector is a semiconductor diode, the β and γ detectors are G-M tubes. (For details, see TID-4100.) (TCO)

35795 ALPHA-, BETA- AND GAMMA-RAY SPECTROSCOPY. VOLUME I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965. 897p.

Twenty-four papers are included in volume 1; separate abstracts were prepared for twenty-two. One paper was previously abstracted for NSA; see 19: 13132. The remaining paper deals with the evolutionary trends in nuclear spectroscopy. (L.B.S.)

For abstracts of individual papers see: 35796–35805, 36001, 36002, 36046, 36185–36192, and 36350.

35796 BETA-RAY SPECTROMETER THEORY AND DESIGN. MAGNETIC ALPHA-RAY SPECTROSCOPY. HIGH-RESOLUTION SPECTROSCOPY. Siegbahn, K. pp 79-202 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

A general discussion is presented of the various approaches to the development and design of spectrometers. Some basic relations in beta spectroscopy and definitions of some concepts are first given. The various types of spectrometers and the fundamental theoretical problems are then discussed, which include the semicircular spectrometer; the double focusing spectrometer; sector field spectrometers; proposed high-transmission instruments; lens spectrometers; magnetic alpha-ray spectroscopes; and electrostatic spectrometers. Precision spectroscopy is also treated. (257 references.) (L.B.S.)

35797 CRYSTAL DIFFRACTION SPECTROSCOPY OF NUCLEAR γ RAYS. Knowles, J. W. pp 203-43 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

Early studies of nuclear gamma rays by direct crystal diffraction are briefly reviewed. The theory of crystal diffraction spectrometers is discussed, in particular, the similarities between the different forms that are important to the measurement of gamma-ray wave-lengths corresponding to energies greater than a few hundred kilovolts. The characteristics of bent-crystal and flat-crystal spectrometers are treated in greater detail. (52 references.) (L.B.S.)

35798 SCINTILLATION METHOD. Neiler, J. H.; Bell, P. R. pp 245-302 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

Applications of the scintillation counter for charged-particle spectrometry and for gamma radiation are discussed. Scintillation methods for gamma spectrometry are treated in detail, including single-crystal spectrometry, total absorption and anticoincidence arrangements, and coincidence arrangements. (113 references.) (L.B.S.)

35799 PROPORTIONAL COUNTERS AND PULSE ION CHAMBERS. Curran, S. C.; Wilson, H. W. pp 303-44 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

A general discussion is presented on proportional counting in gases. The application of the ionization chamber to the detection and energy measurement of alpha particles is mainly considered, with a straightforward extension of the technique to the measurement of protons and other heavy particles. (116 references.) (L.B.S.)

35800 SEMICONDUCTOR PARTICLE SPECTROMETERS. Gibson, W. M.; Miller, G. L.; Donovan, P. F. pp 345-78 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

The important properties and applications of semiconductor particle detectors are discussed. Consideration is given to detector noise, radiation damage, electronics, and detector types. A brief account is given of the chief advantages and limitations of these detectors as applied to nuclear physics experiments. (130 references.) (L.B.S.)

35801 SAMPLE AND WINDOW TECHNIQUE. Parker, William; Slaetis, Hilding. pp 379-407 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

Sample preparation for α-, β-, and γ-ray spectroscopy is considered. Techniques employed for the preparation of thin foils and films used as backings for samples and as windows for G-M tubes are given. A short description is given of the most commonly employed deposition methods and techniques for the preparation of radioactive material, while a more complete table is given that may be considered as a general preparation guide. Methods for determining window absorption corrections are also considered. 83 references. (L.B.S.)

35802 INTENSITY DETERMINATION OF PHOTOGRAPHICALLY RECORDED CONVERSION LINES. Slaetis, Hilding pp 409-11 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

A method is briefly described for determining the intensity of photographically recorded conversion lines, based on the Silberstein formula for photographic density. (L.B.S.)

35803 MULTI-CHANNEL PULSE-AMPLITUDE ANALYZERS. Boulding, F. S. pp 413-23 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

The development and uses of multichannel pulse-amplitude analyzers for nuclear spectroscopy are reviewed. The basic characteristics of multidiscriminator analyzers, gray-wedge analyzers, amplitude-time converters, and multiparameter analyzers are described, along with data storage and display systems. 26 references. (L.B.S.)

35804 MEASUREMENT OF SOURCE STRENGTH. Allen, R. A. pp 425-65 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

Techniques for directly measuring the disintegration rate of a radioisotope source are treated in two categories: direct counting methods, which include defined solid-angle counting, 4π counting, scintillation counting, and internal gas counting, and coincidence methods. Some of the more indirect methods are also mentioned, including calorimetry, ionization chamber measurement, and the loss-of-charge method. 95 references. (L.B.S.)

35805 PROCEDURES FOR THE INVESTIGATION OF DISINTEGRATION SCHEMES. C. THE COINCIDENCE METHOD. Wapstra, A. H. pp 539-55 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

The basic principles, methods, and apparatus for delayed coincidence measurements for the construction of decay schemes are reviewed. (L.B.S.)

Radiation Effects

35806 (CEA-R-2918) EFFETS DU RAYONNEMENT γ DU ^{60}Co ET DE NEUTRONS THERMIQUES SUR DU SILICIUM P ET N DE HAUTE RESISTIVITE. POSSIBILITE DE REALISER UNE COMPENSATION NUCLEAIRE D'UN SILICIUM DE TYPE P. (Effect of ^{60}Co gamma Radiation and of Thermal Neutrons on High-Resistivity P and N Silicon. Possibility of Obtaining a Nuclear Compensation for P-Type Silicon). Messier, Jean (Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires). 1965. 102p. Dep. mn.

Thesis. Submitted to Paris Univ., France.

Type p silicon was compensated by the production of a controlled and uniform amount of donor atoms (^{31}P) using thermal neutrons to bring about a nuclear transformation. It is shown that it is possible in this way to reduce by a factor of about one hundred the overall concentration of residual ionized impurities in the purest crystals obtained by floating zone purification (2×10^{12} atoms/cm^3). The degree compensation obtained is limited by the initial inhomogeneity of acceptor impurities which have to be compensated. Lattice defects which still remain after prolonged annealings reduce the lifetime of the material to about 10 μs approximately. Particle detectors having thicknesses of 2 to 5 mm were built by this process; they give good results, particularly at low temperatures. (auth)

35807 (LA-DC-7654) DISTURBANCE OF CAPACITIVE LIQUID LEVEL GAGES BY NUCLEAR RADIATION. Willis, Walter L. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [1966]. Contract W-7405-eng-36. 20p. (CONF-660605-5). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Cryogenic Engineering Conference, Boulder, Colo.

Liquid level in the dewars at the Nuclear Rocket Development Site is monitored by temperature profiles, carbon resistor point sensors, and capacitance gages which provide a continuous indication. The continuous nature of the capacitance gages led to heavy reliance on the indication of level provided during reactor tests. Incorrect behavior of these gages during tests in June of 1965 led to reactor damage. The major difficulty with the capacitance gage is the high impedance of the probe units. The excitation frequency and capacitance values yield impedances on the order of a megohm. If a low impedance system could be employed, radiation effects would become negligible. A solution to the problem appears to be a system called time domain reflectometry, or TDR. This system measures the characteristic impedance of a transmission line and detects the gas-liquid interface by the sudden change in impedance. In this system the characteristic impedance is approximately 50 ohms. Tests indicate that radiation does not disturb this system. It was concluded that capacitance gages cannot be relied upon for future operations when the reactor is at high power levels. For these intervals two systems will be used. One is a set of fixed point sensors. The other will be TDR. (auth)

35808 (N-66-18378) THERMAL ANNEALING OF RADIATION-DAMAGED SILICON. Fang, P. H. (National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center). [1965]. 10p. (NASA-TM-X-56306). CFSTI $1.00 cy, $0.50 mn.

Some observations associated with the kinetics of defect annealing in silicon are reported. So-called n-on-p solar cells were used in the experiment, the front surface of the cell consisting of n-type (P-doped) silicon about 0.5μ thick. Under this was an n-p junction of about 0.5μ thickness, and the electrodes were Ag-Ti alloy. The annealing was conducted in a hydrogen atmosphere to avoid oxidation of the electrodes. Included are graphs of a typical quantum yield curve, change in quantum yield from the original value, and isothermal recovery of the short circuit current. (STAR)

35809 TRANSITORY VARIATION OF THE DIRECT CHARACTERISTIC OF A DIODE IRRADIATED IN A PULSED REACTOR. Schuttler, Roland (Faculte des Sciences, Toulouse). Compt. Rend., Ser. B, 262: 1536-8 (June 13, 1966). (In French).

A transient variation appears in the irradiation by a pulsed reactor of p-i-n diodes polarized in the straight forward direction. The direction of the variation of the current is opposed to that caused by a γ-ray pulse. (tr-auth)

35810 DESIGN CONSIDERATIONS IN RADIATION HARDENING OF TELEMETRY AND CONTROL CIRCUITRY IN SPACECRAFT. Van Allen, Roland L. (Goddard Space Flight Center, Greenbelt, Md.). 10p. (CONF-650707-24). ORAU.

From IEEE Annual Conference on Nuclear and Space Radiation Effects, Ann Arbor, Mich.

The testing of MOSFET performance during gamma, electron, and proton irradiation is reported. These transistors are used in telemetry encoding systems for spacecraft. Curves are given which show the performance of the MOSFET transistors subjected to various radiation doses. (J.F.P.)

35811 NEUTRON-INDUCED DISPLACEMENT DAMAGE IN INTEGRATED CIRCUITS. McElroy, J. A.;

Boornard, A.; Gandolfo, D. A. (Radio Corp. of America, Camden, N. J.). 7p. (CONF-650707-21). ORAU. Gmelin, AED-CONF-65-152-22.

From IEEE Annual Conference on Nuclear and Space Radiation Effects, Ann Arbor, Mich.

A determination was made as to whether degradation in overall circuit performance can be predicted from the behavior of individual circuit components. To determine whether radiation damage is produced which may be peculiar to silicon integrated circuits a reactor neutron and a subsequent gamma irradiation of a typical digital logic circuit was performed. It was concluded that the change in circuit characteristics of a representative silicon integrated current mode logic gate can be predicted from the behavior of individual transistors when the dominant effect of neutron-produced displacements is reduction of minority carrier lifetime. (J.F.P.)

ISOTOPE TECHNOLOGY

General

Refer also to abstract 35845.

35812 (ORO-647) COMPARATIVE MERITS OF RADIOISOTOPE AND MACHINE SOURCES OF X RADIATION FOR AEROSPACE APPLICATIONS. (Franklin GNO Corp., West Palm Beach, Fla.). Mar. 30, 1966. Contract AT(40-1)-3406. 87p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Results of a study performed to define the relative advantages and limitations of radioisotope and machine sources of radiation for typical aerospace applications are presented. The advantages and limitations of representative state-of-the-art gamma and x-radiation sources were examined with regard to the aerospace application potential. The areas of unique difference between radioisotope and machine sources are isolated and described in order to delineate clearly the area of aerospace application particularly suitable to each of these radiation sources. (auth)

35813 CONSTRUCTION, INSTALLATIONS, EQUIPMENT, AND INSTRUMENTATION OF THE CENTRAL DE RADIOISOTOPOS. Bol. Junta Contr. Energ. At. (Peru), 10: 58-70(July-Dec. 1965). (In Spanish).

The JCEA of Peru will construct a radioisotope center for the activation, preparation, distribution, and control of radioisotopes used in Peru. The construction, installations, equipment, and instrumentation of this radioisotope center are described. The design and construction plans are given. Information is also included on the equipment cost, accompanied by photographs of the basic equipment. (J.S.R.)

35814 GENERAL PROCEDURE FOR THE OPERATION OF CENTRAL DE RADIOISOTOPOS. Bol. Junta Contr. Energ. At. (Peru), 10: 71-7(July-Dec. 1965). (In Spanish).

The general procedure for operation of Central de Radioisotopos is outlined. Recommendations made by OIEA experts are included. (J.S.R.)

Industrial Applications

Refer also to abstract 35990.

35815 (AECL-2422) CANADIAN FOOD IRRADIATION FACILITIES. Warland, H. M. F.; MacQueen, K. F. (Atomic Energy of Canada Ltd., Chalk River (Ontario)). Apr. 1966. 20p. (CONF-660609-3). Dep. mn. AECL $0.50.

From International Symposium on Food Irradiation Meeting, Karlsruhe, Ger.

The development and operation of Canadian food irradiation facilities are discussed. Information is included on gamma cell 220, mobile ^{60}Co irradiator, shielded room facility, and an irradiator for potatoes. (J.R.D.)

35816 APPLICATION OF RADIOISOTOPES IN BATTERY RESEARCH. Euler, J. (Varta AG, Frankfurt am Main). Chem.-Ing.-Tech., 38: 631-7(June 1966). (In German).

In the development of primary batteries and accumulators the use of radioisotopes produced interesting results. The velocity or capacity of the exchange of ions or atoms between electrode and electrolyte can be determined by radioactive tracers. With autoradiographic methods, corrosion phenomena, regeneration processes in dry cells, or the sulfating of plates in Pb accumulators can be studied. By incorporation of active nuclides or by reactor irradiation, improvements were obtained in the electrochemical activity of gas electrodes and in the modification of the electric conductivity. Thickness and density measurements by absorption of radiation are also considered. (tr-auth)

35817 RADIATION PASTEURIZATION OF GULF COAST OYSTERS. Novak, Arthur F.; Liuzzo, Joseph A.; Grodner, Robert M.; Lovell, Richard T. (Louisiana State Univ., Baton Rouge). Food Technol., 20: 103-4(Feb. 1966).

This investigation was conducted to observe the effects of low-dose γ radiation on oysters, with emphasis on organoleptic qualities, initially and after various intervals of ice-packed storage; bacteria (total counts) inactivation, and chemical changes commonly associated with quality deterioration in shellfish. Gulf Coast oysters irradiated at 0.15, 0.2, and 0.3 Mrad showed 0.2 Mrad to be the maximum level tolerated without producing adverse organoleptic changes. Oysters irradiated with 0.2 Mrad and stored in crushed ice for 7, 14, and 21 days were superior in flavor, odor, and appearance to unirradiated samples after 7 days' storage, and still acceptable after 21 days. Irradiation reduced initial bacteria counts by 99%. Trimethylamine and ammonia increased more rapidly in unirradiated oysters than in irradiated oysters. These organoleptic, chemical, and bacteriological analyses thus indicate that low-level irradiation can be used successfully to improve the keeping quality of Gulf Coast oysters by reducing the original bacteria count. This could be of considerable economic importance to the oyster industry in that area since most of the oysters are processed to be distributed and marketed as chilled fresh oysters. (BBB)

35818 PRODUCTION OF LEATHER-LIKE RESINS BY MEANS OF RADIATION VULCANIZATION. Blokh, G. A.; Zhurko, V. A.; Denisenko, V. E.; Tsipenyuk, E. V.; Belousova, E. A.; Meleshevich, A. P. Izv. Vyssh. Ucheb. Zaved., Tekhnol. Legkoi Prom., No. 2, 79-83(1964). (In Russian).

Leather-like rubber should have a tear resistance of >70 kg/cm^2, a relative elongation of >210%, residual elongation of 25 to 65%, a Shore hardness of >80, and a bending angle of >25°. After vulcanizing for 16 minutes at 143°C, a leather-like rubber (a butadiene styrol rubber) was given a ^{60}Co dose of 25×10^6 rads, and it was found that the above requirements of the Russian government were met with a tear resistance of 115 kg/cm^2, a relative elongation of 320%, a residual elongation of 53%, a Shore hardness of 95, and a bending angle of 32°. From experiments on a heated, drum-type machine (Bersdorf) with irradiation doses of 15 to 100×10^6 rads it was found that the strength and hardness increased with irradiation dose, but the relative elongation and bending angle decreased with increasing dose. A dose of 64.8×10^6 rad gave optimum mechanical properties to the rubber. Satisfactory rubber material could be obtained even if the vulcanizing agent were removed. (TTT)

35819 ELECTRON RADIATION CURING OF VINYL MONOMER/UNSATURATED POLYESTER MIXTURES. Hoffman, A. S.; Smith, D. E. (High Voltage Engineering Corp., Burlington, Mass.). Mod. Plast., 43: 111-19 (June 1966).

The use of electron irradiation to cure vinyl monomer–unsaturated polyester mixtures for wood coating or impregnant applications was investigated. A new electron accelerator, the ICT-500, was developed specifically for thin film or fabric applications and is especially suited to the curing of surface coatings on a variety of substrates or of surface-impregnated woods. Electrons are accelerated to energies of 500-kev at beam currents up to 20 mamp. The beam may be spread out or scanned up to 72 in. in width. Mixtures of three vinyl monomers, styrene, ethyl acrylate, and methyl methacrylate, with two unsaturated polyesters, were irradiated with this electron accelerator.

The extent of cure was evaluated as a function of composition, dose, and dose rate by measuring volatile monomer, sol, and gel content of the irradiated mixtures. The use of radiation to cure such mixtures offers special advantages over conventional techniques. (TCO)

35820 TECHNOLOGICAL USE OF IONIZING RADIATION FOR IMPROVING PROPERTIES OF TANNED SKINS. Strakhov, I. P.; Shifrin, I. G. Nauch. Tr. Moskov. Tekhnol. Inst. Legkoi Prom., No. 30, 48-55(1964). (In Russian).

During irradiation of skins in the integral dose interval from 10^4 to 10^6 rad, a steady increase in the tanning temperature and an increase in the durability of the underside of skin was observed. The effect discovered in Russian leather and the undersides of the skins during γ irradiation was caused, in all probability, by the increase of bonds formed between collagen chains and molecules of the tanning agent and also between the albumin chains. (tr-auth)

35821 THE EFFECTS OF NUCLEAR RADIATION ON COTTON CELLULOSE. PART II. Pande, A. (Shri Ram Inst. for Industrial Research, Delhi). Textile Rec., 82: 78-9(Sept. 1964).

The effects of β, γ, and neutron radiation on the structure of cotton, its dyeing properties, and potential uses in finishing processes are reviewed. Irradiation, in an atmosphere of nitrogen or oxygen, imparted increased solubility in water and in dilute alkali, and a decrease in the tensile strength of the fibers. Progressive decreases in the size of the fibrillar fragments of γ-irradiated fibers with increasing doses were observed by optical and electron microscopy. The fragmentation pattern of electron irradiated fibers differed from that of unexposed fibers only at dose levels of 10^8 rep or higher. In irradiated samples, increased absorption of the direct dye Congo Red was observed. When mercerized cotton yarn and partially acetylated cotton yarn were irradiated with electron and γ rays, their tensile strength increased slightly with dose levels up to 0.1 Mrep, and then decreased rapidly. However, a marked increase was noted in the tensile strength of a yarn irradiated at 0.1 Mrep and then partially acetylated. The copper number, the intrinsic viscosity, the acetyl values, and the physical properties of the irradiated acetylated yarns are shown. Use of radiation in finishing treatments, notably crease-resist finishing, which involves impregnation of the fabric with a condensable substance such as a synthetic resin precondensate is also discussed. (TCO)

35822 THE EFFECTS OF NUCLEAR RADIATION ON COTTON CELLULOSE. PART III. Pande, A. (Shri Ram Inst. for Industrial Research, Delhi). Textile Rec., 82: 73; 80(Oct. 1964).

Fiber modification by radioinduced graft polymerization, mainly in relation to cotton and Nylon, is discussed. An effort was made to minimize depolymerization of cellulose while grafting was being initiated. A vapor-phase technique for the radiation grafting of volatile vinyl monomers onto fiber substrate was developed. The monomer is applied from the vapor phase while the samples are exposed to γ radiation from ^{60}Co. The monomers investigated were methyl acrylate, ethyl acrylate, acrylonitrile, butadiene, vinyl acetate, methyl methacrylate, vinyl chloride, styrene, ethylene, propylene, and divinyl sulfone. The radiation addition to acrylonitrile gives a fiber that is almost completely resistant to microorganisms. This effect can be obtained by the deposition of 3.5% of the monomer as polymer and the fiber retains the appearance and feel of untreated cotton. The amount of graft is directly related to the total radiation dose. A method for radioinduced grafting of styrene onto Nylon fibers to produce a fabric with greatly improved water-repellent properties was also developed. (TCO)

35823 SUPPLYING THE NEW SHORT LIVED RADIOPHARMACEUTICALS. 9p. (CONF-651111-9). ORAU. Gmelin, AED-CONF-65-323-12.

From Symposium in Medicine No. 9 Radioactive Pharmaceuticals, Oak Ridge, Tenn.

The availability, half life, and preparation and delivery of short lived radioisotopes for use in pharmaceuticals are discussed. Several solutions or partial solutions to the problem of production and delivery are given. (P.C.H.)

Power Application

See also ENGINEERING — Space Propulsion

Refer also to abstract 36019.

35824 NEW POWER SOURCE: THE RADIOISOTOPE THERMOELECTRIC GENERATOR. Campana, R. J. (General Dynamics Corp., San Diego, Calif.). Electron. Ind., 25: 82-5(May 1966).

The design and performance of SNAP 15A and the performance of semiconductor and metal thermocouples are described. Included are test results, a safety and hazards evaluation, and a description of uses. The unit is illustrated and its performance data are given. Heat is supplied by the decay of radioactive ^{238}Pu contained in a fuel capsule, which, in turn, is held in place by a capsule holder. The capsule holder is recessed at one end into which the hot junctions of the thermocouples are potted with silicone rubber to form one end of the thermopile. The thermopile consists of 1300 thermocouples. The max dose rate at the surface of the generators from neutrons and γ radiation is ~10 mrem/hr. When compared to the whole-body tolerance of 7.5 mrem/hr/8-hr day for lab workers, the generator is a negligible hazard. As the power output is increased, holding the operating parameters and output voltage fixed, the efficiency increases rapidly. This isotope power source is good for very long life tasks, for long shelf life, or for standby use. The device may be used under extreme ranges of environmental conditions. Because of its high reliability, the low-power unit may be used for reserve power when the primary sources fail. The fail-safe unit can provide power continuously at its rated level or intermittently at higher power outputs along with an accumulator. Where remote location makes maintenance costs high, the low-power unit may be useful in providing long-life instrument power. (M.O.W.)

35825 RADIOISOTOPE-FUELED THERMOELECTRIC GENERATORS. Hittman, F.; Silverstein, C. C. (Hittman Associates, Inc., Baltimore). 17p. (CONF-650826-4). ORAU. Gmelin, AED-CONF-65-210-6.

From International Conference on Energetics, Rochester, N. Y.

A description is given of various SNAP radioisotope-fueled thermoelectric generators. Discussions are presented for the selection of radioisotope fuels. Safety requirements are described briefly. The use of these generators with spacecraft is also described briefly. (M.O.W.)

35826 APPLICATION OF RADIOISOTOPE BRAYTON CYCLE SPACE POWER SYSTEMS. Schmitt, J. W.; Gitlow, B. Jr. (Pratt and Whitney Aircraft, East Hartford, Conn.). 22p. (CONF-651110-26). ORAU. Gmelin, AED-CONF-65-327-1.

From American Society of Mechanical Engineers, Annual Winter Meeting, Chicago.

A power source of 3 to 10 Kw(e) capacity is required for long duration operation in conjunction with various types of space vehicles. One power system of interest for this application is a closed Brayton cycle system which uses a radioactive isotope as the heat source. Various design aspects of such a system are described. Included is a description of a representative power plant, a discussion of some of the system design considerations, and estimates of system performance. (auth)

Separation and Production

See also CHEMISTRY — Separation Processes and Procedures

Refer also to abstract 35536.

35827 (MLM-1299, pp 22-33) ISOTOPE SEPARATION AND PURIFICATION. (Mound Labs., Miamisburg, Ohio).

The eight-stage CH_4 thermal diffusion system was temporarily converted to process enriched feed. A quantity of 44 stp liters of 54% $C^{13}H_4$ will be separated into a fraction containing 95% $C^{13}H_4$ and a fraction containing less than 1% $C^{13}H_4$. The new decomposer is not more efficient than the older system. Piperidine in a methanol solution was evaluated; separation was low due to remixing, caused by the low boiling point of the solvent. Approximately 2.5 liters of 10% ^{21}Ne were accumulated as feed for the new three-column Ne tube bundle. Calculations were started on a column profile developed from a ternary mixture. Studies were made of various sized columns for additional columns to separate ^{38}Ar. Intermediate Kr is being reprocessed to enrich ^{86}Kr to 80%. This material will be used as feed for the next pass. The Ca trap installed in the thermal diffusion column product ^{124}Xe line reduced the H_2 and other impurities to 0.1%. The heats of adsorption of Kr and Xe on Linde's Molecular Sieve 13X, 50/60 mesh, were calculated to be −1249 and −1953 cal/mole, respectively, based on separations that used N_2 as the carrier gas. The source of the discrepancy between theory and experiment for recent thermal diffusion column experiments was found. A stagnant gas barrier appears to be present in the experimental columns. Measured composition profiles are in good agreement with theory except at the top end of the column where the composition is anomalous. Parasitic remixing coefficients were measured as a function of wire displacement. The data do not agree with theoretical predictions for a plane parallel column. The generalized Weber-Schmidt equation derived previously was integrated to give the thermomolecular pressure as a function of pressure at the warm end of the tube. It has been found that round-off errors of the order of one part in 10^6 significantly alter the results. Calculations of higher precision are being made to eliminate these errors. (auth)

35828 (MLM–1300) MOUND LABORATORY PROGRESS REPORT FOR OCTOBER 1965. Eichelberger, J. F.; Grove, G. R.; Jones, L. V. (Mound Lab., Miamisburg, Ohio). Oct. 20, 1965. Contract AT-33-1-GEN-53. 27p. Dep. mn, CFSTI $2.00 cy, $0.50 mn.

Continued refinement of mathematical techniques for data processing is reported using the data obtained at 25°C for the hydrolysis of uranyl nitrate. Studies of the hydrolysis of uranyl nitrate at 0°C were continued and preparation of plutonyl nitrate hexahydrate was investigated. A least-squares fit of a logarithmic plot of the Jezebel leakage neutron spectrum was made. The spectrum is considered to be the sum of a Maxwellian distribution of neutrons liberated in the fission process and a Maxwellian distribution of neutron energies undergoing at least one inelastic collision. Three different amines were examined for C isotope separation by chemical exchange. Precipitation problems occurred in all three cases. When monoethanolamine in isopropanol was used a separation factor approaching 3.00 was obtained. Static tests are being run on the three-column neon tube bundle measuring the separation in the center column. Build-up of the ^{38}Ar peak in the five-stage cascade is continuing gradually, approaching an estimated peak of 24% ^{38}Ar. Using intermediate feed of 79% ^{86}Kr, the draw-off has been enriched to 91%, the highest concentration to date. The xenon tube bundle cascade has enriched ^{124}Xe to 2% and ^{126}Xe to 0.88%. Minimum equilibrium times were calculated for various ^{124}Xe product concentrations. A plan for ^{124}Xe profile build-up was also developed. The heats of adsorption of Kr and Xe on activated alumina H-151, 50/60 mesh, were calculated to be -1970 and -3181 cal/mole, respectively. Nitrogen was used as a carrier gas. Some work was also done with activated alumina F-1, 50/60 mesh. This work was abandoned when the adsorbent proved to be poor for Kr−Xe separations. This completes exploratory examination of adsorbents for Kr−Xe separation. On the basis of the exploratory work, Molecular Sieve 13X appears to have the most favorable characteristics. Thermal diffusion column transport coefficients for $^{20}Ne-^{22}Ne$ were found to be in good agreement with theory in experiments with one of the 12-ft (3.65-cm dia.) experimental hot wire columns. Measurements of the parasitic remixing coefficient were completed in the 6-ft (1.83-cm dia.) column. Experiments were performed on the He−Ar and He−Xe systems to determine the thermal diffusion factor as a function of temperature and composition. These experiments were performed in a recently installed Trennschaukel or swing separator system in which the experimental conditions may be closely controlled for long periods of time. The results show a disappointing experimental scatter. An error analysis was made of all the variables in the experiments and the conclusion was reached that the mass spectrometric analyses of the gas samples are not sufficiently precise. This is based upon the findings of the error analysis that no observed deviations of the control system could introduce such large discrepancies and, secondly, that no mechanism exists which would substantially enhance the thermal diffusion separation. Thermomolecular pressure data were obtained for saturated ^3He vapors with cold temperatures as low as 0.36°K. The data are compared with previous results and with the Weber-Schmidt equation. This completes the sequence with this set of connecting tube radii since data have now been collected for saturated and unsaturated vapors of both ^3He and ^4He. The nuclear magnetic resonance spectrometer was electronically modified to provide homonuclear spin decoupling in order to simplify complex spectra by eliminating proton-proton spin interactions. The decoupling of the three methyl protons from the two methylene ones of ethyl alcohol was demonstrated. (auth)

MATHEMATICS AND COMPUTERS

35829 (COO–614–45) ICR QUARTERLY REPORT NUMBER 9. Miller, Richard H. (Chicago Univ., Ill. Inst. for Computer Research). May 1, 1966. Contract AT(11-1)-614. 152p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

Progress reports are presented which include the Maniac-III engineering activity, data transmission between Maniac III and the IBM 7040, Man-Machine program, μ-capture program, inter-nuclear cascades induced by high-energy particles, convergence of an accelerated iterative method in the solution of singular equations, nonlinear P-compact operators in Banach space, polarization in stellar dynamical systems, relaxation in a model cluster, Gilbert's analytic grammar, and the production and stabilization of real-time task schedules. (B.G.D.)

35830 (NYO–1480-48) ENGINEERING ASPECTS OF HIGH-SPEED DATA DISTRIBUTION. Ruben, Fredric (AEC Computing and Applied Mathematics Center, New York Univ., N. Y.). Mar. 1, 1966. Contract AT(30-1)-1480. 41p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A computer system is proposed for efficient and rapid data selection and distribution. The system is described by the following: computer hardware specifications, memory configuration, memory selection, memory request conflicts, conflict checker, memory addressing (time-sharing system), true bank selection, data distribution, data and address distribution belt operation, and data distribution belt limitations. (B.G.D.)

35831 (ORNL–3986) AN EXPLICIT MODIFIED MULTISTEP METHOD FOR THE NUMERICAL INTEGRATION OF ORDINARY DIFFERENTIAL EQUATIONS. Harkrider, Millard T. (Oak Ridge National Lab., Tenn.). July 1966. Contract W-7405-eng-26. 52p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

Thesis. Submitted to Univ. of Tennessee, Knoxville.

It was earlier shown by Dahlquist that the maximum order of a stable linear multistep method for the numerical integration of an ordinary differential equation is $k + 2$. It is also known that extreme difficulty is encountered while attempting to achieve high orders with methods of the Runge-Kutta type. By the addition of one term to the linear multistep method, Gragg and Stetter introduced a new class of methods which combine the Runge-Kutta and multistep ideas. Butcher has given explicit formulas for the case of two predictors and one corrector formula and attained an order of $2k + 1$. Explicit formulas are exhibited for the case of one predictor and one corrector formula. It is shown that this method has order $2k$. The difference operators for the predictor, corrector, and combined formulas are exhibited. The stability region for each value of k was plotted and is included. This method has the advantage that an order of $2k$, as opposed to the standard $k + 2$, may be obtained with no additional computation. (auth)

35832 (ORNL–TM–1575) THE SFR-3 CODE: A FORTRAN PROGRAM FOR CALCULATING THE FREQUENCY RESPONSE OF A MULTIVARIABLE SYSTEM AND ITS SENSITIVITY TO PARAMETER CHANGES. Kerlin, T. W.; Lucius, J. L. (Oak Ridge National Lab., Tenn.). June 30, 1966. Contract W-7405-eng-26. 30p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A computer code was prepared for calculating the frequency response of a multivariable system and the sensitivity of this frequency response to parameter changes. The method provides sensitivity information by utilizing operators available from the usual frequency response calculation and the resulting increase in computing time required to obtain sensitivities over the time required to obtain the frequency response alone is insignificant. The FORTRAN IV listing is given along with a complete input description and a solved sample problem. (auth)

METALS, CERAMICS, AND OTHER MATERIALS

General

Refer also to abstracts 36391 and 36476.

35833 (AERE-M-1706) THE SEGREGATION OF UO_2 AND ThO_2 POWDERS MIXED TO FINE-SCALE HOMOGENEITY. Poole, K. R.; Wake, R. W. (Atomic Energy Research Establishment, Harwell (England)). May 1966. 14p. Dep. BIS $0.60. HMSO 3s.

An investigation of the segregation which occurs when mixtures of nuclear fuel oxide powders are handled was carried out using a mixture of UO_2 and ThO_2. The influence of free pouring and conveying down an inclined chute were studied. It is concluded that the degree of segregation which occurs is of little practical significance and that a similar result would be expected with any mix containing an agglomerating material like UO_2. (auth)

35834 (BMI-1767) PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING MARCH, 1966. Keller, Donald L. (Battelle Memorial Inst., Columbus, Ohio). Apr. 1, 1966. Contract W-7405-eng-92. 37p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Research progress on reactor materials and components, fuels, UN–PuN fuel materials, a portable smoke photometer, coated-particle fuel materials, and corrosion studies of fluidized-bed fluoride volatility processes. (M.C.G.)

35835 (DPST-66-83-5) USAEC-AECL COOPERATIVE PROGRAM. Monthly Progress Report, May 1966. Hilborn, H. S. (comp.) (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). June 10, 1966. Contract AT(07-2)-1. 12p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Samples from the simulated burned-up fuel rods were chemically analyzed. There is several per cent spread in the measured Pu/U ratios. More work is necessary to resolve these discrepancies. Substitution buckling measurements in the PDP were completed for two of the three host lattices. Temperature coefficient measurements in the SE were completed. Preliminary analyses indicate a negative coefficient at a 9.33-in. triangular pitch, and a coefficient close to zero at an 11.5-in. square pitch. The extensive SE foil measurements are on schedule. Analyses of hydride orientations in two series of specially fabricated Zircaloy tubing indicated that the hydride orientation directional strain parameter (DϵP) is an equilibrium relationship that develops after a moderate amount of fabrication processing and annealing. At least two fabrication steps with similar DϵP's followed by anneals appear to be necessary to obtain the equilibrium hydride orientation. As a corollary of this conclusion these data also show that tubing with a good fabrication history and a circumferential hydride orientation preference can undergo a light, low-DϵP finishing step without large changes in the fraction of rapidly oriented platelets. On the other hand the radial orientation produced by large amounts of low-DϵP processing can only be overcome with difficulty. Fabrication and installation of the rod for neutron flux monitoring in the reactor was completed and testing is in progress. (auth)

35836 (KR-89, pp 1-29) PROPERTIES OF SINTERED URANIUM DIOXIDE. Runfors, Ulf (Aktiebolaget Atomenergi, Stockholm (Sweden)).

Properties of UO_2 and their relations to reactor fueling costs are discussed. Information on UO_2 is included concerning properties and costs, reactions with canning materials, reactions with water, dimensional stability, fission product retention, thermal performance, and fabricability. (J.R.D.)

35837 (KR-89, pp 63-81) PROPERTIES OF METALLIC URANIUM. Ostberg, G. (Aktiebolaget Atomenergi, Stockholm (Sweden)).

A review of metallic U properties is presented in which it is noted that there are no apparent limitations that make unfeasible its substitution for UO_2 in water-cooled reactors in which it may offer advantages. The larger swelling may be accommodated by proper design of the fuel component, allowing for some decrease in the cross section for coolant flow. The rate of corrosion at defects in the cladding may be kept sufficiently low to permit indication and retraction of the element before any serious malfunctions develop. (J.R.D.)

35838 (KR-89, pp 97-111) ALUMINIUM AS CANNING MATERIAL. Videm, Ketil (Institutt for Atomenergi, Kjeller (Norway)).

The best test of the feasibility of Al as a cladding material is in reactor exposure of Al-clad fuel elements at typical power reactor temperatures and pressures. Such experience is limited and was accumulated mostly by ANL. It appears that much experimental work, both in-pile and out-of-pile, has to be done before a thorough understanding of fuel element behavior is achieved. Such knowledge is necessary for the design of rational and economic Al-canned fuel elements. It is felt that the reduction in fuel costs which can be achieved with Al as a cladding material, justifies the efforts. (J.R.D.)

35839 (KR-89, pp 112-30) STAINLESS STEEL AS FUEL ELEMENT CANNING MATERIAL IN WATER COOLED REACTORS. Spalaris, C. N. (General Electric Co., San Jose, Calif. [Atomic Power Equipment Dept.]).

A review of stainless steel use and performance as fuel element cladding in water cooled reactors is presented. Information is included on stainless steel mechanical properties, corrosion, radiation effects, and performance in thin claddings. (J.R.D.)

35840 (KR-89, pp 131-52) STAINLESS STEEL AS CANNING MATERIALS FOR STEAM COOLED REACTORS. Spalaris, C. N. (General Electric Co., San Jose, Calif. [Atomic Power Equipment Dept.]).

Aspects of stainless steel performance in steam cooled reactors are examined. Conditions encountered by these materials in superheat reactor systems are discussed along with their corrosion and irradiation behavior. (J.R.D.)

35841 (NAA-SR-11900) AEC UNCLASSIFIED PROGRAMS. Quarterly Technical Progress Report, January–March 1966. (Atomics International, Canoga Park, Calif.). June 6, 1966. Contract AT(11-1)-Gen-8. 170p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

Research progress is reported on a secondary sodium-steam system, boiling studies for sodium reactor safety, fuel irradiation, stability and properties of cladding and structural alloys in a fast neutron environment, sodium metallurgy, Sodium Reactor Experiment operation, the sodium component test installation, steam generator installation, precision mechanisms in sodium, high-temperature strain measurements, PNPF fuel element examination, core-II SAP-clad UC fuel element development, PNPF core-II design, PNPF catalytic hydrocracking coolant processing system, extrapolation length measurements, cross-section analysis and applications, fast spectrum Doppler measurements, reactor physics theories, integral reactor physics experiments, fission effects in UC and other refractory fuels, moderator materials development, fission effects in metal fuels, metal–hydrogen systems, sodium chemistry, reactor dynamics simulator development, Doppler coefficient studies, fission product retention by reactor coolants, fission product and contamination control, sodium fires and fission-product release, high-temperature chemistry, radiation chemistry, electronic structure of metals and alloys, and radiation damage in crystalline solids. (M.C.G.)

35842 (ORNL-3795(Pts.1 and 2)(Suppl.)) A BIBLIOGRAPHY ON TRACER DIFFUSION IN METALS: PART I. SELF-DIFFUSION IN PURE METALS. PART II. IMPURITY DIFFUSION IN PURE METALS. Askill, John (comp.) (Oak Ridge National Lab., Tenn.). June 1966. Contract W-7405-eng-26. 10p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Frequency factors, activation energies, and other data for self- and impurity diffusion in pure metals were compiled from the literature reported between December 1964 and December 1965. (auth)

35843 PURIFICATION OF IRON AND ZIRCONIUM BY DISPLACEMENT OF A TRANSFORMED ZONE. Ailloud, Pierre; Langeron, Jean-Paul (ENSCP, Paris. Centre d'Etudes de Chimie Metallurgique, Vitry, France). Compt. Rend., Ser. C, 262: 1656-9(June 13, 1966). (In French).

By displacement of a γ-phase zone along an iron rod and of a β-phase zone along a zirconium rod, a segregation of impurities agreeing with the equilibrium diagrams was observed in the case of these two metals. The purification is more significant in the case of zirconium than in the case of iron. The enclosure is developed by ultrahigh-vacuum techniques. The length of the zone is maintained constant by an apparatus for the control of the furnace temperature. (tr-auth)

35844 ROLE OF CARBON GASIFICATION IN THE REDUCTION OF URANIUM OXIDES. Tkachenko, E. V.; Vlasov, V. G. (Ural Polytechnic Inst., USSR). Izv. Vyssh. Ucheb. Zaved., Tsvetn. Met., No. 2, 103-9(1966). (In Russian).

The role of the carbon gasification reaction $C + CO_2 \rightarrow 2CO$ in the reduction of the higher U oxides with solid carbon was investigated. A total of 80% oxide was mixed with 20% C by weight. The effects of CO_2 pressure on the kinetics of the UO_3 reduction by C were investigated at temperatures of 470° for amorphous UO_3, 550° for alpha-UO_3 and gamma-UO_3, 700° for U_3O_8, and 850°C for U_4O_9. It was found that the following reactions were practically irreversible, and only a low concentration of CO was required to complete the reaction: $3UO_3 + CO \rightarrow U_3O_8 + CO_2$; $0.8\ U_3O_8 + CO \rightarrow 0.6\ U_4O_9 + CO_2$; and $U_4O_9 + CO \rightarrow 4UO_2 + CO_2$. The carbon gasification reaction played a noticeable role in the reduction only at temperatures exceeding 500°C. (TTT)

35845 PLUTONIUM: PAST, PRESENT, FUTURE. Seaborg, Glenn T. (Atomic Energy Commission, Washington, D. C.). S. Afr. Mining Eng. J., 77: 720-4(Apr. 1, 1966).

Discovery of plutonium is traced, and its present and proposed applications are surveyed. A new phase in the development of this element has been emerging as plutonium reaches a much broader state of application. These broader applications of plutonium are intimately tied to its production and use in reactor fuel cycles. With the projected growth of nuclear power in this country, potential production of plutonium would be about 20,000 to 30,000 kg/yr by 1980. Problems in the utilization of this plutonium are discussed. Present and future uses of plutonium isotopes, particularly ^{238}Pu and ^{242}Pu, are considered. (TCO)

Corrosion

35846 (CEA-R-2932) ETUDE DE L'ADSORPTION EN ATMOSPHERE FLUORANTE. (Adsorption Studies in a Fluorinating Atmosphere). Abassin, Jean-Jack; Barberi, Paul; Guillouet, Yves; Hartmanshenn, Olivier; Lambard, Jacques; Machefer, Jacques; Michel, Jean (Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires). Mar. 1966. 78p. Dep. mn.

Aspects of the adaptation of conventional or non-conventional apparatus to the measurement of the physical and chemical adsorption of corrosive fluorine-containing gases are reviewed. Discussions are included on thermogravimetry, volumetry, use of radioactive tracers, calorimetry, hertzian spectroscopy, and infrared spectroscopy. In each of these cases, problems of corrosion call for the use of special techniques which require the extensive use of pure Ni and Al or their alloys. Diagrams of the apparatus and some examples of applications are given, together with some details of the performances. (auth)

35847 (DP-1008) THE ROLE OF DISLOCATIONS IN TRANSGRANULAR STRESS-CORROSION CRACKING OF AUSTENITIC STAINLESS STEELS. Louthan, McIntyre R. Jr. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). Mar. 1966. Contract AT(07-2)-1. 26p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Studies that correlate dislocation substructure with transgranular stress corrosion cracking in austenitic stainless steel are summarized. Evidence is presented to show that the primary role of dislocations in the mechanism of cracking is to provide a continuous supply of localized anodic regions for selective electrochemical attack. The results show that cracking occurs preferentially on the {111} family of planes and that dislocation movement, and therefore deformation, is required in the cracking process. Possible methods of reducing transgranular stress corrosion cracking include any process or alloy change that either inhibits dislocation movement, promotes cross slip, or reduces the tendency for corrosion. (auth)

35848 (DP-1023) STRESS-CORROSION CRACKING OF CARBON STEEL IN SIMULATED WASTE SOLUTIONS. Costas, L. P.; Holzworth, M. L.; Rion, W. C. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). June 1966. Contract AT(07-2)-1. 33p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A laboratory corrosion test program was carried out to determine the cause of cracking failure in carbon steel tanks used for the storage of radioactive waste. Welded test specimens (carbon steel plate, 36 inches square × ½-inch thick, ASTM A285 Grade B) suffered stress-corrosion cracking in simulated waste solutions containing nitrate. The cracks induced in the laboratory were similar to the cracks observed in the plant. Full stress relief, which prevented stress cracking of the specimens in the test solutions, should be considered for future tanks of this type. (auth)

35849 (KR-89, pp 82-96) ZIRCONIUM ALLOYS AS SHEATHING MATERIALS. Robertson, J. A. L. (Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.).

There is general agreement on the selection of Zircaloy for sheathing in water-cooled reactors that operate with sheath temperatures around 300°C. To minimize the thickness of sheath required, the Zircaloy is normally used in the cold-worked condition. Provided the fabrication route does not yield a product susceptible to adverse hydride orientation, hydriding has not been found to be a limitation in Zircaloy-2, and the use of Zircaloy-4 further reduces the chance of failures due to this cause. Zr–Nb alloys offer the higher strength required in thinner sheaths, but at the price of more rapid hydriding than for Zircaloy-4. Over 500°C the corrosion rates are such that there is little prospect of any Zr alloy being useful for superheat sheathing. Even for intermediate temperatures much development will be necessary to realize the apparent promise of experimental alloys. (auth)

35850 (N-66-17887) A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF THE OXIDATION OF MOLYBDENUM AT TEMPERATURES AT WHICH ITS TRIOXIDE IS VOLATILE. Schryer, David R.; Walberg, Gerald D. (National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center). Mar. 1966. 42p. (NASA-TR-R-232). CFSTI $2.00 cy, $0.50 mn.

A theoretical and experimental investigation is made of the oxidation of Mo to MoO_3 at temperatures at which the trioxide is volatile. A rate equation was derived which includes the effects of mass-transfer and chemical parameters, and is applicable to any situation for which a mass-transfer coefficient can be obtained. The derived equation

was applied to previously reported rate data taken under laboratory conditions using air and O_2–He mixtures flowing at low subsonic velocities, and a set of values for the activation energy of the oxidation of Mo was obtained. The average of these values is 8.51×10^7 J-(kg-mole)$^{-1}$ (20.3 kcal-(g-mole)$^{-1}$) with a standard deviation of 2.0%. In addition, 32 Mo hemisphere-cylinder specimens were oxidized in a Mach 2.1 heated air stream at a free-stream stagnation pressure of 1.07×10^6 N-m^{-2} (10.5 atm) and free-stream stagnation temperatures from 1765 to 2120°K. The stagnation-point surface temperature and recession rates, determined for each of the specimens, generally compared with the corresponding values predicted theoretically to within a factor of about 2. A few specimens ignited, exhibiting recession rates much greater than those predicted, apparently as the result of a sharp rise in surface temperature which caused some melting of the specimens in addition to their normal oxidation. (auth)

35851 (USNRDL-TR-1036) ELECTROCHEMICAL CORROSION STUDIES OF SNAP CONTAINER MATERIALS. Kubose, D. A.; Cordova, H. I. (Naval Radiological Defense Lab., San Francisco, Calif.). June 7, 1966. Contract AT(49-5)-2084. 24p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Corrosion rates of Haynes 25, Hastelloy C and Hastelloy N in natural seawater were determined by galvanostatic polarization techniques. Values of approximately 10^{-2} mils per year were obtained for each of the alloys. No significant effect of aeration and solution stirring on the corrosion rates was observed. (auth)

35852 (AEC-tr-6738) THE CREVICE CORROSION AND PITTING OF STAINLESS STEELS IN CHLORIDE SOLUTIONS AT TEMPERATURES UP TO 100 DEG C. Fokin, M. N.; Kurtepov, M. N.; Zhuravlev, V. K.; Oreshkin, V. I. Translated from Paper No. SWD/63 Presented at the First International Symposium on Water Desalination, October 3-9, 1965, Washington, D. C. 20p. (CONF-651005-13). Dep. mn. CFSTI $1.00 cy, $0.50 mn. JCL $1.60 fs, $0.80 mf.

A potentiostatic method was used in an electrochemical investigation concerning the effects of acid-reducing properties of NaCl test solutions under N_2 atmospheres on anodic dissolution of stainless steels. Data concerning pitting corrosion at temperatures up to 100°C are presented graphically, and an evaluation of these data is included. (J.R.D.)

35853 CATHODIC PROTECTION IN MOLTEN FLUORIDE SALTS AT 1200 F. Matson, L. K. (Battelle Memorial Inst., Columbus, Ohio); Stephan, E. F.; Miller, P. D.; Boyd, W. K.; Milford, R. P. Corrosion, 22: 194-7 (July 1966). (ORNL-P-1083).

Experiments were carried out on a laboratory scale to determine the feasibility of using cathodic protection to reduce the attack in process vessels for the recovery of nuclear fuel. Polarization curves were developed under simulated operating conditions for the materials of interest, i.e., Inor-8, Zircaloy, and graphite. Polarization characteristics were obtained by use of a potentiostat using platinum as a reference electrode and graphite as an anode. Experiments using rectangularly shaped coupons were carried out to determine the amount of protection furnished by the impressed current technique in the most corrosive salt composition. Specimens were made cathodic at current densities ranging from 3 to 50 amp/ft^2. Excellent protection was furnished to the submerged portions of the specimens. However, severe attack occurred at the interface at reasonable current densities. (auth)

35854 OXIDATION CHARACTERISTICS OF THE LANTHANIDE METALS. Greene, N. D. (Rensselaer Polytechnic Inst., Troy, N. Y.); Hodge, F. G. Corrosion, 22: 206-13(July 1966).

Oxidation rates and rate equations of La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, and Y were determined in dry and moist air in the temperature range from 100 to 800°C (212 to 1472°F) by precision weight gain measurements. Oxide structures were examined by both metallographic and x-ray analyses. Observed oxidation characteristics are related to oxide structures and the physicochemical properties of the rare earth metals. (auth)

35855 INVESTIGATION ON THE CORROSION OF ZIRCONIUM IN ORGANIC SOLUTIONS IN THE PRESENCE OF HYDROGEN CHLORIDE. Wertenbach, H.; Lieser, K. H. (Technische Hochschule, Darmstadt, Ger.). Kerntechnik, 8: 307-9(July 1966). (In German).

The corrosion of Zr in ethanol, benzene, and ethyl ether was investigated at room temperature using reactor-grade zirconium and ^{95}Zr as tracer. The corrosion of zirconium in hydrochloric acid–ethanol solutions of various concentrations was determined as a function of time. In organic electrolyte solutions the reactions possible with hydrochloric acid and with water are in competition with each other. At very small concentrations of water and very high concentrations of hydrochloric acid, the protective oxide layer on the surface is slowly dissolved and then, with hydrogen evolution, a very rapid corrosion occurs since insufficient oxygen is present to form another oxide layer. At higher water concentrations the rapid corrosion is prevented since a new protective oxide layer is formed. If the hydrochloric acid is too low (<1 mole/l), then the oxide layer is not dissolved. The type of organic solvent plays only a secondary role. (tr-auth)

Fabrication

Refer also to abstracts 35693, 35702, and 36494.

35856 (AAEC-E-148) DEVELOPMENT OF CERAMIC COATINGS FOR FISSION-PRODUCT RETENTION IN CERAMIC FUELS. Ramm, E. J.; Smith, P. D.; Reeve K. D. (Australian Atomic Energy Commission Research Establishment, Lucas Heights). Jan. 1966. 16p. Dep. mn.

A general discussion on glaze-type coatings for fission product retention within BeO spheres fueled with PuO_2–ThO_2 particles is presented. From these considerations, a glaze thickness of 0.004 in. was chosen as a basis for laboratory studies. Glaze development commenced with a conventional high temperature glaze; this was modified by increasing the SiO_2 content and by progressively replacing some of the SiO_2 by TiO_2, ZrO_2, TiO_2–ZrO_2, BeO, and BeO plus TiO_2. Glaze structures varied from amorphous to predominantly crystalline. When applied to fueled BeO cubes, some glazes failed to cover fuel particles and others tended to react with them. It is concluded that glaze type coatings show little promise for the present applications. (auth)

35857 (AAEC-TM-311) IMPURITIES AND THEIR EFFECTS IN NUCLEAR-GRADE BERYLLIA POWDERS. Reeve, K. D. (Australian Atomic Energy Commission Research Establishment, Lucas Heights). Jan. 1966. 18p. Dep. mn.

The criteria for sinterability in high-purity beryllia powders are discussed. Of common impurities in less-pure powders, Si, Al, Ca, Mg, and Fe are considered to have the major effects on sinterability. Of these, Si and Al have detrimental effects, and Ca, Mg, and Fe beneficial effects. It is suggested that for an impure powder to be sinterable, the combined (Si + Al) content should be no higher than the combined (Ca + Mg + Fe) content. (auth)

35858 (ANL-7164) DEVELOPMENT AND FABRICATION OF A BORON ABSORPTION TUBE FOR SPECTROGRAPHIC ANALYSIS. Dusek, J. T. (Argonne National Lab., Ill.). Mar. 1966. Contract W-31-109-eng-38. 8p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Techniques were developed for fabricating thin-walled B tubes for use as hollow-cathode discharge tubes in spectrographic applications. The most successful specimens made contained 10 wt % of W. Data are presented on composition of the B specimens and the high-temperature interactions that occurred during specimen sintering. (auth)

35859 (CONF-660606-9) A MATERIALS, FABRICATION, AND DESIGN FEASIBILITY STUDY FOR A

HIGH-TEMPERATURE, UNCOOLED, ARTICULATING CONTROL ROD. Baxter, W. G.; Tenhundfeld, J. W. (General Electric Co., Cincinnati, Ohio. Nuclear Materials and Propulsion Operation). June 24, 1966. Contract AT(40-1)-2847. 59p. (GE-TM-66-6-23). Dep. mn. CFSTI $3.00 cy, $0.75 mn.

From American Nuclear Society Meeting, Denver.

The results of a program to establish the materials criteria, preliminary design criteria and fabrication procedures for an uncooled articulating control rod are presented. Assumed conditions of operation includes contact with graphite in an inert atmosphere at 1000 to 1040°C (1800–1900°F) for thousands of hours. Involved in this program was the selection of materials, demonstration of the long term stability, fabrication techniques for the control materials, methods for joining the control rod segments to achieve articulation, and operational evaluation under environmental conditions. (auth)

35860 (EURAEC-1651) EXPERIMENTAL CONTRIBUTION TO THE METALLURGICAL STUDY OF GAS CUTTING AND SINGLE J GROOVING BY OXYACETYLENE BLOWPIPE. Annual Report, 1965. (Institut de Soudure, Paris (France)). Contract 007-64-TEEF(RD). 34p. (EUR-2849). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Work Performed under United States–Euratom Joint Research and Development Program.

Metallographic and thermal studies of oxyacetylene blowpipe grooving are repeated. The maximum temperatures attained in the parent metal were very near the melting temperature. Therefore gas cutting was definitely effected through fusion. At the point where it strikes the metal, the oxygen jet has a cooling effect, which is added to that of the thermal conductivity. In the case of blowpipe grooving, the heating flame then intervenes to moderate the cooling rate. It was found that the cooling rate in the neighborhood of cuts diminishes when the thickness to be cut increases. It was therefore concluded that heavy plates can be cut in all cases where thin plates of the same grade are cut without inconvenience. Thus any steel that can be welded can be prepared by gas-cutting. The J or double J grooving on thick plates was particularly indicated for pre-welding preparation. (M.C.G.)

35861 (KR-89, pp 181-96) COMPARISON BETWEEN VIBRATORY COMPACTED, SWAGED, AND PELLET FILLED ELEMENTS. Schmitten, W. in der (Nuklear-Chemie und-Metallurgie G.m.b.H.; Wolfgang bei Hanau (West Germany)).

Fuel elements fabricated by swaging and vibratory compaction are compared in terms of clad damage introduced during fabrication. Swaging is inferior because of the unsatisfactory clad treatment. A second comparison is presented between fuel elements containing vibratorily compacted powder and sintered pellets in terms of in-pile behavior and costs. The differences in in-pile behavior dependent on bulk properties like density and cohesion between radial fuel layers and those dependent on properties imposed by the pellet design are considered to be minor. The fabrication costs for normal cylindrical fuel elements are estimated to be about 6% lower for vibratory compaction than for the sinterline (not including assembly, capital and fuel costs). In tubular rods fused powder exhibited heat transfer coefficients for the inside fuel clad interface superior to pellets with a diametral inner gap of 200 μ. Further promising fields for investigation include complicated fuel geometries (tube in shell design), and remote handling of recycled fuel with residual activity. (auth)

35862 (ORNL-3951, pp 3-83) FUELED-GRAPHITE DEVELOPMENT. Coobs, J. H., McCurdy, H. C.; Sisman, O. (Oak Ridge National Lab., Tenn.).

Summaries of results are presented on each of the following carbon-coated fuel development studies: (1) pyrolytic-carbon coating studies; coatings deposited from methane in a 2-in. dia fluidized bed, deformation characteristics of porous coatings deposited from acetylene, coatings deposited from propane in a 1-in. dia fluidized bed, and structural changes induced in pyrolytic carbon by fast neutrons, (2) analysis of thermodynamic data for nuclear ceramics; UC_2, UO_2, ThO_2, UC_2-UO_2, vaporization of UC_2, and the enthalpy of vaporization of U, (3) phase studies of the pseudobinary system UC_2-ThC_2 in the presence of excess graphite, phase transitions and lattice parameters of ThC_2-UC_2, (4) conversion of sol-gel oxide particles to carbides, conversion of ThO_2-UO_2 to ThC_2-UC_2 and conversion of ThO_2 to ThC_2, (5) testing and evaluation of coated fuel particles, use of mathematical model for optimization of coating thickness ratios, preparation and evaluation of coated fuel particles for irradiation tests, loading of second x-basket, comparison of coatings of specimens for x-basket experiment by microhardness determinations and postirradiation examination of specimens tested in ETR x-basket experiment ORNL-43-89, (6) fabrication studies of fission product emitting fuel, (7) evaluations of experimental fuel assemblies, examination of Experimental Fuel Assembly 14 after irradiation in GCR-ORR Loop 1, irradiation of Experimental Fuel Assembly 15 in GCR-ORR Loop 1, (8) high-burnup coated particle irradiation experiment in ORR position F-9, (9) compatibility of oxide fuel pellets and graphite under irradiation, and (10) coated-particle irradiations in LITR. (M.O.W.)

35863 (ORNL-TM-1495) DOPING OF SEMICONDUCTORS USING ION IMPLANTATION TECHNIQUES. Alton, G. D.; Love, L. O. (Oak Ridge National Lab., Tenn.). June 1966. Contract W-7405-eng-26. 8p. (CONF-651073-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Ion Beam Bombardment and Doping of Semiconductors Conference, Pasadena, Calif.

The calutron-type electromagnetic isotope separator was employed as a means of implanting Group III and V elements to produce n-p, p-n, and n-p-n junctions in silicon, silicon carbide, gallium arsenide, and germanium. The ability to control kinetic energies and doping levels and the discrete range of penetration achieved make use of this instrument desirable in permanent-type conversion of semiconductor surfaces. In order to obtain uniform deposition over sizable substrate areas, maximize the amount of data obtainable per bombardment period, and minimize the cost of bombardments, special techniques and equipment were developed to permit multiple substrate irradiations. The source and receiver components used and the doping techniques employed are described. (auth)

35864 (RFP-741) IMPROVED SERVICE LIFE OF 15-kg REDUCTION REACTOR VESSELS. Nelson, L. L. (Rocky Flats Div., Dow Chemical Co., Golden, Colo.). June 6, 1966. Contract AT(29-1)-1106. 19p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Reduction vessels used for bomb reducing batches of UF_4 to uranium metal were failing after approximately twenty-five runs. The failures were caused by progressive cracking around the inside of the top of the vessel. These vessels were centrifugally cast from Type-310 stainless steel. It was determined that the cracking was caused by sensitization from the thermal cycling to which these vessels were subjected. Sensitization resistant Type-347 stainless steel is now used for the reactors and no cracking was evident to fluorescent penetrant inspection. (auth)

35865 (RSIC-491) THE CASTING AND POWDER-METALLURGY FORMING OF PRECIPITATION-HARDENABLE STAINLESS STEELS. Kura, J. G.; Barth, V. D.; McIntire, H. O. (Battelle Memorial Inst., Columbus, Ohio). Apr. 20, 1966. Contract DA-01-021-AMC-11651 (Z). 50p. (NASA-TM-X-53444).

The state of the art of making shapes of precipitation-hardenable stainless steels by methods other than machining from wrought materials is reviewed. The methods reviewed are casting and powder metallurgy. Of these methods, only casting is extensively practiced. Powder metallurgy is a promising procedure for 17-4 PH stainless, but techniques are not well advanced for handling the grades that contain Ti or Al such as PH 15-7 Mo and A-286. (auth)

35866 (SCL-DC-66-52) FINISHING HIGH-STRENGTH BERYLLIUM PRESSINGS. Johnson, D. M. (Sandia Corp.,

Livermore, Calif.). [1965]. Contract AT(29-1)-789. 24p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Methods of finishing and certifying complex structural parts made of high-strength, fine-grain beryllium pressings were developed during a six-month investigation. The method of finishing, involving a combination of controlled machining and etching, makes it possible to produce parts of high precision and maximum strength. The method of certification combines destructive testing of finished tensile specimens and nondestructive inspection of the critical areas on the finished parts. (auth)

35867 (TRG-Report-1180) PYROLYTIC-CARBON-COATED URANIUM CARBIDE PARTICLES. THE EFFECT OF DEPOSITION CONDITIONS ON COATING EFFICIENCY, STRUCTURE, AND DENSITY. Ford, L. H.; Ingleby, B. E.; Hibbert, N. S. (Reactor Group, United Kingdom Atomic Energy Authority, Springfields (England)). Jan. 24, 1966. 25p. Dep. BIS $1.00, HMSO 5s.

The efficiency of pyrolytic C coating deposition on UC particles was shown to vary directly with the surface area of the bed and temperature of deposition, and inversely with increase in CH_4 partial pressure and degree of fluidization. Variations of coating structure were classified into five groups, four according to the degree of isotropy and the size of the grain structure observed, and the fifth by the absence of any visible structure. For the equipment used, the structure of the coatings was found to vary with the surface area of the charge, the temperature of coating, gas composition, and the degree of fluidization. Measurements of coating density show the well known minimum density region in the temperature range 1400 to 1600°C but independently of coating structure. (auth)

35868 NEW TYPES OF GRAPHITE. Rappeneau, J. (CEN, Saclay, France); Bochirol, L. Bull. Inform. Sci. Tech. (Paris), No. 105, 3-16(June 1966). (In French).

Nuclear graphite of which reactor stacks are formed is derived from a mixture of petroleum coke and pitch. After drawing, baking, and intermediate pitch impregnation the product is graphitized at high temperature. With a view to improving the physical properties of conventional nuclear graphite, new types of graphite were developed. The principles of the preparation of these graphites, which make use of the conventional method of manufacture or of new processes such as the cracking of hydrocarbons in particular, are described briefly. The physical properties of these materials, especially thermal and mechanical, and also the properties related to their texture are examined. A comparison between the properties of these graphites and those of conventional nuclear graphite shows that the use of new manufacturing processes or new basic materials enables artificial graphites of quite different physical properties to be obtained. (auth)

35869 FABRICATION OF THIN URANIUM DIOXIDE PLATES FOR NUCLEAR ENERGY FUEL ELEMENTS. Fargo, Jarvis J. (International Pipe and Ceramics Corp., Parsippany, N. J.). Interspace Tech. J., 1: 13-16(1964).

An economical method, which involves a rolling process for forming thin, flat plates of UO_2, was developed. In the rolling process a mix of UO_2 powder and organic binder is passed between two rolls which compact the mix to form a continuous strip that can be cut or punched to form pieces of the desired shape. The shape is then sintered to high density. The appearance of the UO_2 particles under the microscope was essentially the same after the milling as it was before milling. A study of the bulk density of the UO_2 powders showed that dry milling substantially increased the density of several of the materials. A cellulose compound in solution with an organic solvent was used as the binder material. A rolling study showed that UO_2 strip of excellent quality could be reproduced with good dimensional control. A sintering study showed that rolled UO_2 sheet could be consistently sintered to a density of 10.40 to 10.65 g/cm^3 (95 to 97% of theoretical density). A check of the sintered UO_2 part showed that it was essentially of stoichiometric proportions of $UO_{2.00}$. (TCO)

35870 ELECTRODEPOSITION OF REFRACTORY METALS. Senderoff, S. (Union Carbide Corp., Parma, Ohio). J. Inst. Metals, 94: 97-112(July 1966).

The electrodeposition of titanium, zirconium, hafnium, vanadium, niobium, tantalum, chromium, molybdenum, and tungsten is discussed in detail. Processes for electrodeposition considered are electrowinning, electrorefining, electroplating, and electroforming. The electrodeposition of refractory metals in coherent form is discussed in both aqueous and molten-salt systems. The fluoride electrolyte process, as well as earlier processes for electroplating metal coatings, are reported. (89 references) (D.H.M.)

35871 HOW TO PROCESS BERYLLIUM. Steel, 158: 42-4(June 6, 1966).

Procedures for forming, forging, casting, drilling, electrochemical machining, and joining beryllium are described and illustrated. Light gage sheets can also be spin formed into hemispherical cones and pressure rings. Ring style draw dies provide the best way to swage tubing to get a 50% reduction in diameter. Beryllium can be compression forged below 1450°F. This technique may have more potential than casting. Cast and forged parts must be stress relieved after machining. This can be done in regular atmospheres up to 900°F; above that, inert atmospheres must be used. In drilling Be metal, regular high speed steel drills should not be used. Grade C-2 carbide types are preferred for holes up to $\frac{3}{16}$ in. For joining, beryllium can be induction and dip brazed and soldered. In some uses it can be fusion welded in inert atmospheres. (BBB)

35872 EXPERIMENTAL STUDY OF THE WELDING OF BORON STEELS FOR REACTOR USE. Yosetsu Gijutsu, 13: 79-82(June 1965). (In Japanese).

Tests were carried out on welds in two different materials, mild steel–boron steel, and stainless steel–boron stainless steel. The chemical compositions (%) of the materials were as follows: for mild steel, C(0.16), Mn(0.58), P(0.007), and S(0.024); for boron steel, C(0.06), Si(4.46), Mn(0.60), P(0.008), S(0.028), Cu(0.23), Al(0.165), and B(1.78); for stainless steel, C(0.10), Si(0.58), Mn(0.61) P(0.042), S(0.016), Cr(13.48), and Ni(0.32); for boron stainless steel, C(0.02), Si(0.27), Mn(1.51), P(0.007), S(0.007), Cr(18.96), Ni(9.96), Co(0.06), and B(1.75). The welding rods used were LB55, NC38, NC39, NC32 and NC30. In the welding of mild steel and boron steel with LB55 or NC30, cracks were produced in the deposit metal in the welded state. In the bending test, the two materials, welded together, with LB55 showed many cracks on the side of boron steel at about 50°. Welding with NC39 gave comparatively good results in the bending strength, and therefore the conditions for heat treatment were studied. In the welding of stainless steel and boron stainless steel with NC38, NC39, and NC30, bending tests produced cracks in the deposit metals. In consequence, only materials welded with NC32 by the shielded arc and TIG methods were further studied for heat treatment conditions. (NSA of Japan)

35873 ON THE CONTINUOUS CASTING OF ALUMINUM–URANIUM ALLOYS. Duerrschnabel, Wolfgang; Lange, Ekkehard (Nuklear-Chemie und Metallurgie GmbH, Wolfgang, Ger.). Z. Metallk., 57: 451-4(June 1966). (In German).

Alloys of Al with 18 and 24 wt-% U in the shape of ingots of 70 and 100 mm dia were produced by continuous casting. To overcome the gravitational segregation that occurs in the course of casting, a specially constructed feeding system proved to be useful. After heat treatment at 600°C the ingots could be rolled into strip or extruded with good success. (auth)

35874 METHOD OF MAKING HOLLOW SPHERICAL UO_2 PARTICLES. Barr, H. N.; Sundquist, L. A. (to U. S. Atomic Energy Commission). U. S. Patent 3,270,098. Aug. 30, 1966.

An invention relating to a method of making hollow spherical UO_2 particles is described. UO_2 particles are oxidized and mixed with a small amount of an additive, granulated, spheroidized in a high temperature flame, and reduced in

H_2 at high temperature. In one embodiment, the particles are oxidized in O_2 at high temperature, $CaO-TiO_2$ is used as the additive, and an oxyacetylene flame is employed to produce the spherical particles with a hollow cavity therein. (AEC)

35875 OXIDATION-RESISTANT COATING ON ARTICLES OF YTTRIUM METAL. Wilder, David R.; Wirkus, Cecil D. (to U. S. Atomic Energy Commission). U. S. Patent 3,266,928. Aug. 16, 1966.

A patent is described relating to a process for producing an oxidation-resistant coating on Y by applying a suspension of vanadium oxide and Al_2O_3 powders to the Y and heating it. (AEC)

35876 CARBIDE DEPOSITION ON TANTALUM. McGuire, Joseph C. (to U. S. Atomic Energy Commission). U. S. Patent 3,266,948. Aug. 16, 1966.

Tantalum metal is heated in contact with lampblack in an atmosphere of H_2 at 800 to 1100°C. (AEC)

35877 PROCESS OF MAKING A SINTERED, HOMOGENEOUS DISPERSION OF NUCLEAR FUEL AND BURNABLE POISON. Bean, Charles H. (to U. S. Atomic Energy Commission). U. S. Patent 3,263,004. July 26, 1966.

A patent is described relating to a process of making a nuclear fuel including less than 1% of a lanthanide rare earth oxide and comprises: mixing from 2 to 25% of the rare earth oxide with 98 to 75% of UO_2; impact fusing the mixture; cooling and grinding the product; adding this product to additional UO_2 to obtain the desired proportion; and shaping, compacting and sintering the fuel mass thus obtained. (AEC)

35878 APPARATUS FOR MANUFACTURING SHAPES OF URANIUM CARBIDE. Hofmann, Friedrich; Schafer, Lothar (to U. S. Atomic Energy Commission). U. S. Patent 3,259,470. July 5, 1966.

An invention is described consisting of an apparatus for continuously manufacturing shapes of uranium carbide by heating bodies compressed from uranium oxide and graphite. The compressed bodies are placed in a storage vessel from which they are transported by a conveyer belt to a gate and through a tubular chute into an evacuated induction chamber for heating. After heating, the shapes are discharged from the bottom of the induction chamber into a receiving chamber, also under vacuum, where they are allowed to cool. (AEC)

35879 EMBOSSED CLADDING FUEL ELEMENT AND MANUFACTURING PROCESS THEREFOR. Ripley, Charles C. (to U. S. Atomic Energy Commission). U. S. Patent 3,261,756. July 19, 1966.

A patent is described relating to nuclear reactor fuel elements, and in particular to a process for embossing the fuel element to create turbulence-promoting protuberances along the surface thereof. The process comprises the steps of compacting fissile fuel to a medium density in a thin-walled metallic tube, and then applying narrow rolling wheel male dies forceably against the surface of the tube in a helical path to deform the tube and produce embossed areas along the surface of the tube, as well as to preferentially compact the fuel material under the wheel path, providing superior fuel element characteristics. (AEC)

35880 NOVEL METAL MICROSPHERES AND THEIR MANUFACTURE. Schmitt, C. R. (to U. S. Atomic Energy Commission). U. S. Patent 3,264,073. Aug. 2, 1966.

An invention is described providing a method for preparing unitary, hollow, metal microspheres which may be incorporated into low density, high strength metal structures. The method comprises heating phenolic microballoons under an inert atmosphere to a temperature sufficient to coke them thereby forming C microspheres. A metal coating is applied to the C microspheres, followed by removal of the C to form metal microspheres. These metal microspheres may then be formed into a metal structure by pressureless sintering techniques. (AEC)

35881 BROACH FOR CURVED GRAPHITE PASSAGES. Hollister, Ezra (to U. S. Atomic Energy Commission). U. S. Patent 3,268,976. Aug. 30, 1966.

A patent concerning a tool for sizing a long hole formed in the graphite pile of a nuclear reactor is described. The tool comprises a slender central shaft and a series of spiral broaching elements loosely fitting the shaft, the spiral being in opposite directions in alternate broaching elements, the broaching elements being keyed to one another end to end. The hole in the graphite pile would need sizing because of swelling of the graphite due to reactor operation. The hole is actually formed in a series of graphite blocks laid end to end, of which the pile is made up, and tends to curve or meander from one block to the next because of inequalities in the graphite blocks as formed, and unequal swellings of one block in comparison with the next block. The tool, with its individual keyed broaching elements and the loosely fitting slender central shaft, is ideally suited to sizing the meandering hole in the graphite blocks. (AEC)

Properties and Structure

See also CHEMISTRY — Inorganic and Physical Chemistry
PHYSICS — Solid State Physics

Refer also to abstract 36092.

35882 (AAEC-TM-312) THERMOELASTIC STRESS IN EPITROCHOIDAL CYLINDRICAL NUCLEAR FUEL ELEMENTS. Thompson, J. J. (Australian Atomic Energy Commission Research Establishment, Lucas Heights). Feb. 1966. 16p. Dep. mn.

The exact solution is obtained for the two dimensional thermoelastic stress problem of an epitrochoidal cylinder with uniform internal heat generation, for conditions of plane strain. Numerical values are given for the tangential stresses at the crests and troughs of the surface corrugations. (auth)

35883 (ANL-7135) THE BETA → ALPHA TRANSFORMATION IN HIGH-PURITY PLUTONIUM. Rosen, M.; Peterson, R. G.; Lloyd, L. T. (Argonne National Lab., Ill.). Feb. 1966. Contract W-31-109-eng-38. 87p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

The beta → alpha transformation in high-purity Pu metal was investigated by an ultrasonic-pulse method under both quasi-equilibrium and isothermal conditions. Concurrent observations of sound velocities and relative ultrasonic attenuation yielded information on the kinetics and the mechanism of the transformation. The behavior was consistent with a displacive, or martensitic-type, transition. The time-temperature-transformation (TTT) diagram displayed two branches. The high-temperature region, above 313°K, exhibited an athermal character that extrapolated to zero beta → alpha isothermal transformation at 367°K for the purity of the metal used in the present study. Effects of multiple cycling through the $\alpha \rightleftharpoons \beta$ transformation and of interrupted quenching are discussed. Structural damage due to the formation of microvoids and cracks was more extensive in specimens transformed at temperatures in the upper region of the TTT diagram. Anomalies in the sound velocities and attenuation were encountered at 200°K and at about 350°K during slow heating. The possibility of the anomalies at 350°K being caused by a recovery process is discussed. (auth)

35884 (CALT-221-19) SUPERCONDUCTING TRANSITIONS IN BODY-CENTERED-CUBIC THALLUM-INDIUM ALLOYS. Luo, H. L.; Willens, R. H. (California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials). May 1966. Contract AT(04-3)-221. 11p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The structures of quenched In–Tl alloys were studied at low temperatures. Lattice parameters were determined at room temperature and at liquid nitrogen temperatures. The results of measurements of the superconducting transition are tabulated. (J.R.D.)

35885 (DRI–1092-232) STUDIES OF THE EFFECT OF INTERSTITIAL ADDITION ON THE PHASE EQUILIBRIA OF THE NIOBIUM-RICH REGION OF THE NIOBIUM–TUNGSTEN–HAFNIUM AND NIOBIUM–TUNGSTEN–ZIRCONIUM ALLOY SYSTEMS. Quarterly Progress Report No. 7, March 1, 1966–June 1, 1966. Yamamoto, Albert S. (Denver Research Inst., Univ. of Denver, Colo.). Contract AT(11-1)-1092. 10p. (DRI–2335). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The effect of small carbon and oxygen additions on the phase equilibria of the niobium-rich region of the niobium–tungsten–hafnium and niobium–tungsten–zirconium alloy systems is investigated. X-ray analysis data obtained in selected oxygen-bearing alloys are reported. In a majority of the niobium–tungsten–hafnium alloys with small oxygen additions, HfO_2 was found to be the sole second phase. The presence of α-Zr was identified in most of the investigated oxygen bearing niobium–tungsten–zirconium alloys. Additional x-ray diffraction studies are being conducted on samples separated by the use of bromine–methanol phase-extraction method. As a result of preliminary work, it was found that this method complements the phase identification data obtained with the conventional method employing alloy filings. (auth)

35886 (IS–T–80) SINTERING STUDY IN THE PARTIALLY VITREOUS As–S–Se SYSTEM. Carrell, Michael Andrew (Ames Lab., Iowa State Univ. of Science and Tech.). May 1966. Contract W-7405-eng-82. 138p. Dep. mn. CFSTI $4.00 cy, $1.00 mn.

Thesis.

Sintering of vitreous As-S-Se compositions by the sphere-sphere technique led to interesting relationships concerning the viscous flow mechanism. Sphere-sphere-geometric models were proposed to relate surface area to the sintering rate, and one such model was used for this purpose. The slope of the logarithm of the ratio of neck radius to the initial radius plotted against the logarithm of time of sintering was found to be compositionally dependent. Three main types of internal structure are suggested in order of increasing arsenic content: a system of chains and rings with arsenic "pinning points"; trigonal $As(S,Se)_3$ elements bound together by Se-Se, Se-S, and/or S-S linkages; and a dense network of entirely As-S and/or As-Se linkages. When the ratio of surface area to final surface area was plotted against time of sintering the relationship was of the form $A/A_f = -k_1t + k_2$, where A is the surface area at any elapsed time, t, A_f is the surface area finally obtained, k_1 is a constant depending on temperature, and k_2 is a constant depending on composition. This equation indicates a constant dissipation of internal energy by a flow process. Deviation from this linear relationship exists for structures involving ring and long chain configurations at viscosities above approximately $10^{7.5}$ poises, which indicates an introduction of viscoelastic properties. A linear shrinkage equation of the form $-k_1t = -2.11(\Delta L/L) + 7.317(\Delta L/L)^2 - 13.075(\Delta L/L)^3$ was obtained for compositions whose slopes of logarithm of the ratio of neck radius to the initial radius plotted against the logarithm of time of sintering were greater than 0.5; where L is the initial length of the two spheres, $4R_i$; ΔL is the linear shrinkage at any elapsed time, t; and k_1 is a constant depending on the temperature. (auth)

35887 (IS–T–92) INFLUENCE OF OXYGEN ON MECHANICAL PROPERTIES OF Nb–5 PERCENT Zr ALLOYS. De Bruyne, Roger Josephus Emilius (Ames Lab., Iowa State Univ. of Science and Tech.). May 1966. Contract W-7405-eng-82. 101p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Thesis.

The influence of oxygen in the range from 180 to 1170 ppM on the mechanical properties of the Nb–5% Zr alloys was investigated. The alloys were prepared by arc melting and were, after swaging with an approximate reduction of area of 65%, heat treated for one hour at 1400°C in a vacuum of 10^{-6} Torr. The oxygen was present as a coarse equi-axed ZrO_2 dispersion. The influence on yield and flow stresses was determined by compression tests over a strain-rate range of 0.881×10^{-6} to 0.894×10^{-2} inch per inch per second. The yield stress was nearly independent of the oxygen content and its dependence on the strain rate $\dot{\epsilon}$ is given by $\sigma_y = 53{,}500 \times (\dot{\epsilon})^{0.0255}$ psi. The work hardening and the flow stresses, corresponding to the model of Fisher, Hart and Pry, increased linearly with the volume fraction of the dispersion, which was in turn proportional to the oxygen content, C. An empirical expression for the flow stresses at a strain ϵ (in percent) between 5 and 15% is $(\sigma_f)\epsilon,\dot{\epsilon}$, $C = 49{,}000 \times (\epsilon)^{0.2307} \times (\dot{\epsilon})^{0.0217} + S\epsilon,\dot{\epsilon} \times (C\text{--}180)$ psi where $S\epsilon,\dot{\epsilon}$ is the slope of the curve of the flow stresses as a function of the oxygen content. $S\epsilon,\dot{\epsilon}$ has an average value of 2.07. It was concluded that oxygen was a small effect on the room-temperature mechanical properties of these alloys. (auth)

35888 (KR–89, pp 30-54) PROPERTIES OF VIBRATORY COMPACTED UO_2. Schmitten, W. in der (Nuklear-Chemie und-Metallurgie G.m.b.H., Wolfgang bei Hanau (West Germany)).

The fabrication of vibratory compacted fuel elements including the preparation of high-density powder is described. The parameters affecting final fuel density and water content are discussed. In spite of the low thermal conductivity of a fabricated vibratory compacted UO_2 its in-pile behavior matches that of pellets provided that the power (temperature) is high enough to promote structural changes; the speed at which the fuel rod approaches final power is low enough to allow improvement of thermal conductivity due to structural changes including accommodation of expansion by the void volume; and the density is low enough to accommodate the thermal fuel expansion. (auth)

35889 (KR–89, pp 55-62) PROPERTIES OF SWAGED UO_2. Schmitten, W. in der (Nuklear-Chemie und-Metallurgie G.m.b.H., Wolfgang bei Hanau (West Germany)).

The fabrication of swaged UO_2-elements is described. The effects of fabrication variables on the properties of UO_2 are discussed. Experimental results on the in-pile behavior of swaged UO_2 are presented. It is noted that the the power limit for safe operation of swaged UO_2 with densities in excess of 90% of theoretical is well below 560 w/cm. (auth)

35890 (LA–3332) MEASUREMENT OF ALPHA PHASE PLUTONIUM IN PLUTONIUM–1 w/o GALLIUM ALLOY BY ELECTRICAL RESISTIVITY. Anderson, J. W.; Gilmore, R. R. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). Jan. 1965. Contract W-7405-eng-36. 27p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Electrical resistivity measurements have been successfully used to detect the presence of alpha-phase Pu in nominally delta-stabilized alloys. The results compare favorably with those obtained by the density and metallographic methods. (auth)

35891 (NYO–2731-7(App.1)) THE CALCIUM–LITHIUM EQUILIBRIUM SYSTEM. Carfagno, Daniel G. (Syracuse Univ., N. Y. Dept. of Chemistry). June 1966. Contract AT(30-1)-1910. 98p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Thesis.

The calcium-lithium equilibrium system was investigated over the complete range of compositions by thermal analysis, differential thermal analysis, and x-ray methods. The solid solubility of calcium in lithium was very small and reached a maximum of 0.4 at.% at the eutectic temperature. A eutectic occurred at 8.2 at.% calcium. The eutectic temperature was 141°C and extended over the composition range range 0.4 to 33.3 at.% calcium. Only one compound, $CaLi_2$, existed in this system. It was formed through a peritectic reaction at 230°C, which occurred over the composition range 30 to 90 at.% calcium. $CaLi_2$ was found to crystallize in a hexagonal close packed structure with unit cell dimensions $a_0 = b_0 = 6.313$Å and $c_0 = 10.28$Å. The density of $CaLi_2$ was determined by the flotation method to be 1.016 g/cm^3, requiring four "molecules" of $CaLi_2$ per unit cell. The space group was determined from Weissenberg equi-

inclination photographs to be $D^4_{6h} = P_{63}/mmc$. Interatomic distances were calculated from the atom locations. Terminal solid solutions corresponding to the three allotropic modifications observed in pure calcium were generated by peritectic reactions: at 370°C, liquid + γ(hcp) ⟷ β(fcc) over the range 56.3 to 93 at.% calcium; and at 688°C, liquid + δ(bcc) ⟷ γ(hcp) over the range 85.5 to 94 at.% calcium. A specially prepared high-purity sample of calcium yielded conflicting results regarding its allotropy. (auth)

35892 (NYO–3347-1) X-RAY INVESTIGATIONS ON THE STRUCTURE OF EVAPORATED FILMS. Final Report. Witt, Fred (Franklin Inst. Research Labs., Philadelphia, Pa.). June 1966. Contract AT(30-1)-3347. 57p. (F–B2196). Dep. mn. CFSTI $3.00 cy, $0.50 mn.

In situ x-ray investigations were carried out on evaporated metal films in a high vacuum x-ray diffractometer attachment. Copper, silver, and gold films were deposited in vacua between 10^{-7} and 10^{-9} Torr on glass and silver was also deposited on a CaF_2 substrate at 80°K. X-ray measurements were made on the as-deposited films and after various annealing treatments. Information was obtained from the as-deposited films on the intrinsic stacking fault density, twin fault density, uniform and nonuniform strain, crystallite size, and texture. Annealing to various temperatures (up to 350°C) produced considerable grain growth and texture changes, which are qualitatively explained in terms of surface energies and thermal strain energies. (auth)

35893 (ORNL–3951, pp 84-134) INVESTIGATIONS OF FUELED-GRAPHITE SYSTEMS. Sisman, O.; MacPherson, R. E.; Watson, G. M. (Oak Ridge National Lab., Tenn.).

Summaries of results are presented for each of the following development areas: (1) instantaneous fission-gas release experiments, fission gas release from UO_2, fission gas release from coated UO_2 and ThC_2–UC_2 particles; (2) fission product release from high-burnup coated UO_2 and UC_2 particles by postirradiation annealing, fission product release studies, coating stability; (3) fission product transport and deposition, fission product deposition in ORNL out-of-pile loop, packed-bed laminar-flow deposition experiment, fission product deposition static experiment: (4) compatibility of metals with low concentrations of carbon monoxide; (5) compatibility of pyrolytic-carbon-coated fuel particles with water vapor; and (6) recoil of fission products in pyrolytic carbon and graphite. (M.O.W.)

35894 (ORNL–3951, pp 149-63) INVESTIGATIONS OF MODERATOR MATERIALS. Coobs, J. H.; McCurdy, H. C.; Sisman, O.; Witt, F. J. (Oak Ridge National Lab., Tenn.).

An experiment was completed at 700°C as part of the program to evaluate the effect of temperature on the creep rate of graphite. The compatibility of graphite and beryllium oxide was also investigated. The influence of the shape of uniaxial stress-strain diagrams on analysis of thick-walled graphite cylinders as structural materials was investigated. Results are described. (M.O.W.)

35895 (ORNL-TM–1456) CREEP-RUPTURE PROPERTIES OF FS-85 ALLOY AND THEIR RESPONSE TO HEAT TREATMENT. Stephenson, R. L. (Oak Ridge National Lab., Tenn.). July 1966. Contract W-7405-eng-26. 21p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Creep-rupture properties are presented for FS-85 (Nb-27% Ta-10% W-1% Zr) to 1000 hr at 982°C, 1093°C, 1204°C, and 1427°C. Substantial improvements in strength at 982°C and 1204°C can be achieved by pretest annealing 1 hr at 1593°C. These improvements are shown to be stable for at least 1000 hr. Pretest annealing at higher temperatures yields inferior properties. A tentative explanation for these effects is offered in terms of precipitate distribution. (auth)

35896 (TID–23138) FATIGUE CRACK PROPAGATION IN LOW-CARBON STEELS. Mowbray, D. F. (Knolls Atomic Power Lab., Schenectady, N. Y.). June 1, 1966. Contract W-31-109-eng-52. 9p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Results are presented from investigations of A 302 B steel plate specimens with flaw geometry such that cracks emanate from a centrally located through-the-thickness hole. An objective of the tests was to test the hypothesis that crack extension per cycle is controlled by the intensity of the stress field in the vicinity of the crack tip. Results of crack growth analyses indicate that application of the stress intensity factor hypothesis produces good correlation of the data for both test directions. (J.R.D.)

35897 (UCRL–13212) FRICTION IN ULTRAHIGH VACUUM. PRELIMINARY TESTS ON ALUMINUM SURFACES. Frisch, J.; Nelson, R. D.; Pfaelzer, P. (California Univ., Berkeley. Coll. of Engineering). Apr. 1966. Contract W-7405-eng-48. 17p. (MD–66-2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Three preliminary friction tests on aluminum specimens were conducted in the ultrahigh vacuum chamber to check the operational performance of equipment and instrumentation. These tests demonstrated the suitability and capability of the equipment. The calibration and addition of a more efficient strain gage dynamometer in the vacuum chamber as well as some changes in test procedure were suggested by these tests. (M.C.G.)

35898 (UCRL–16803) ON THE MECHANISMS OF DEFORMATION IN DISPERSION-HARDENED ALLOYS. Guyot, P. (Lawrence Radiation Lab., Univ. of California, Berkeley). Apr. 1966. Contract W-7405-eng-48. 33p. (CONF-660626–1). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From 2nd Bolton Landing Conference, New York.

The mechanisms of plastic deformation occurring in alloys with a f.c.c. matrix and in which the incoherent second-phase dispersed particles are generally not deformed with the matrix, are described. At low temperatures these mechanisms are well understood. The cutting of the mobile dislocations through the forest agrees with the experimental results; the hardening is due to the steep increase of dislocation density with the strain. The second phase plays an indirect part (pinning or multiplication of dislocations). At a high enough stress (or strain) cross slipping can be induced, determining a cell structure. At high temperatures various processes can be effective: cross slipping and particle limited climb determine the motion of dislocations in the matrix; for temperatures near the melting point of the matrix, these alloys generally present high activation energies steeply varying with the stress, and the thermal activation of the junction reactions between attractive dislocations explains experimental measurements. (auth)

35899 (AI-Trans–208) A NEW INTERMETALLIC COMPOUND IN THE BINARY SYSTEM Fe–Mo. Zaletaeva, R. P.; Lashko, N. F.; Nesterova, M. D.; Yuganova, S. A. Translated for Atomics International, Canoga Park, Calif. from Dokl. Akad. Nauk SSSR, 81: 415-16(1951). 4p. Dep. mn. CFSTI $1.00 cy, $0.50 mn. JCL $1.10 fs, $0.80 mf.

Identification of a phase in C-containing Cr–Mo–Ni steel is reported. The intermetallic compound Fe_2Mo is precipitated out of supersaturated solid solutions composed of C 0.1%, Cr 16%, Ni 25%, Mo 6% steel after most of the C has combined to form carbides. Results of crystal structure analysis of Fe_2Mo are included. (J.R.D.)

35900 THERMAL EXPANSION BEHAVIOR OF NIOBIUM CARBIDE–GRAPHITE COMPOSITES. Miccioli, Bruno R. (Carborundum Co., Niagara Falls, N. Y.). Contract NOw-64-0412-C. Amer. Ceram. Soc. Bull., 45: 670-3(July 1966).

Thermal expansion characteristics were measured to 2500°C for the thermal shock resistant niobium carbide–graphite composite system. A previously reported high-temperature inversion observed for niobium carbide was also observed for the composite system. Both the inversion and the measured deformation behavior appear to be orientation dependent. (auth)

35901 ZIRCONIUM AND ITS ALLOYS. Michaud, M. Y. Bull. Inform. A.T.E.N. (Ass. Tech. Energ. Nucl.), No. 59, 37-43(May-June 1966). (In French).

A review is given of the properties, preparation, fusion,

transformation, and uses of zirconium and its alloys. (J.S.R.)

35902 ZERO-POINT-OF-CHARGE OF HEMATITE AND ZIRCONIA. Smith, G. W.; Salman, T. (McGill Univ., Montreal). Can. Met. Quart., 5: 93-107(Apr.-June 1966).

The zero-point-of-charge of a natural specular hematite in aqueous solution was determined as pH 8.68 ± 0.12, and that of synthetic ZrO_2 as pH 6.05 ± .04. The adsorption density of the potential-determining ions was found by potentiometric titration and the surface charge and differential capacity of the double layer were calculated. The isoelectric point of ZrO_2 was determined graphically from thermodynamic data. (auth)

35903 EVIDENCE BY AUTORADIOGRAPHY OF AN INTERGRANULAR DIFFUSION OF URANIUM IN URANIUM MONOCARBIDE. Villaine, Philippe; Marin, Jean-Francois (CEN, Grenoble, France). Compt. Rend., Ser. C, 262: 1660-3(June 13, 1966). (In French).

The existence of intergranular diffusion in UC was studied by autoradiography. This diffusion makes it possible to follow the migration of grain boundaries which can be continuous or discontinuous, the placement of the old boundary being marked by the ^{235}U that had diffused into it. The Mott hypothesis takes into consideration the abnormally high diffusability observed for boundaries in motion. (tr-auth)

35904 HIGHER SULFIDES AND SELENIDES OF PLUTONIUM. Marcon, Jean-Pierre; Pascard, Roger (CEN, Fontenay-aux-Roses, France). Compt. Rend., Ser. C, 262: 1679-81(June 13, 1966). (In French).

The compounds PuS_2, $PuSe_3$, and Pu_2S_3 were prepared in 3 crystalline forms α, β, and γ and Pu_2Se_3 in 2 forms η and γ. All these compounds are isotypic with their lanthanide homologs. In particular PuS_2 is a polysulfide and $PuSe_2$ a polyselenide whose structure is derived from the Fe_2As structure type. (tr-auth)

35905 EFFECT OF LANTHANUM AND YTTRIUM ON THE RECRYSTALLIZATION OF MOLYBDENUM. Goltsev, V. P. (Inst. of Nuclear Power Engineering, Academy of Sciences, BSSR). Dokl. Akad. Nauk BSSR, 10: 196-8(Mar. 1966). (In Russian).

Specimens of sintered molybdenum alloys containing 0.06 to 0.2% lanthanum or 0.03 to 0.1% yttrium were vacuum annealed at 1673K, rolled at 1133K with a total reduction of 70%, and again vacuum annealed at 1173 to 1873K to determine the effect of La and Y on the alloy recrystallization behavior. It was found that additions of up to 0.1% yttrium or up to 0.2% lanthanum insignificantly increase the temperature of the beginning of recrystallization. On the other hand, even very small additions of yttrium or lanthanum (0.03–0.06%) sharply increase the temperature of the end of recrystallization. The temperature range between the beginning and the end of recrystallization of molybdenum alloy containing lanthanum or yttrium is rather wide and reaches 250 to 300K. In alloy with 0.2% lanthanum, the first recrystallized grains are formed at 1273K and the recrystallization ends at 1573K. At 1673K, the grain growth begins, but the grain size does not exceed 20 to 25 μ. Only at 1873K does the grain size increase substantially. Lanthanum and yttrium react with interstitial impurities and act as deoxidizers refining the grain boundaries. It appears that the recrystallization behavior of the alloys tested is a result of the presence of finely dispersed particles of the secondary phase, the products of deoxidation. (ATD)

35906 THE NATURE OF PLASTICITY IN Mo–Re ALLOYS. Demkin, Yu. I. (Bardin Inst. of Quality Steels at the Central Research Inst. of Ferrous Metals, USSR). Dokl. Akad. Nauk SSSR, 166: 71-3(Jan. 1, 1966). (In Russian).

A study was made of the influence of Re additions on the plastic flow of Mo at room temperature by determining the plastic properties of Mo-35 at. % Re through electron microscopy and metallography. Generally, the appearance of twinning in bcc metals coincides with low temperature brittleness, whereas the effect of Re on Mo increases the twinning tendencies while increasing the ductility of Mo at low temperatures. Metallographic examination of the twins formed in Mo-35 at. % Re showed them to be fragmented at room temperature as compared with the twins formed at liquid nitrogen temperatures. The dislocation structure, observed by means of transmission electron microscopy, was found to be noncellular—a characteristic of metals with low stacking fault energies. The ease of twinning in this alloy was ascribed to the low stacking fault energy which was responsible for changes in the slip mechanism and consequent low temperature behavior described. The single crystals were deformed on (100) faces by indentation with a microhardness diamond pyramid indenture and the resulting etch pits were found to lie parallel to {112}, which in bcc crystals is characteristic of minimum packing energy for stacking faults. (TCO)

35907 SELF-DIFFUSION OF NIOBIUM IN A NUMBER OF ITS MOLYBDENUM ALLOYS. Geld, P. V.; Velmozhnyi, E. Ya.; Lyubimov, V. D.; Shveikin, G. P. (Ural Polytechnic Inst., USSR). Izv. Vyssh. Ucheb. Zaved., Tsvetn. Met., No. 2, 135-41(1966). (In Russian).

Homogeneous Nb alloys containing 5, 10, 20, 30, and 45% Mo were prepared by melting the constituents in an arc furnace under an Ar atmosphere. The samples were subjected to a ten-hour vacuum anneal at a temperature 150 to 200°C below the melting point. The alloys had a coarse crystalline structure with a grain size of 3 to 5 mm. The diffusion characteristics at temperatures of 1600 to 2100°C were determined with the use of radioactive ^{95}Nb in the form of the oxide. The main measurements were performed at 1700, 1800, 1900, 2000, and 2100°C. Values of the diffusion D in cm^2/sec were related to the activation energy E in kcal/mol as follows: $D = D_0 \exp(-E/RT)$. Values of D, D_0, and E increased up to a Mo concentration of 8%, and then decreased with increasing Mo concentration. Since $E = 176 - 21.7$ [% Mo], then $\ln D_0 = 21.7 - 6 \ln$ [% Mo] = $-26.9 + 0.276$ E. Thus, if the composition of the alloy is known, it is not difficult to determine E and D_0. (TTT)

35908 ELASTIC PROPERTIES OF SOME POLYCRYSTALLINE TRANSITION-METAL MONOCARBIDES. Brown, Harry L.; Armstrong, Philip E.; Kempter, Charles P. (Los Alamos Scientific Lab., N. Mex.). J. Chem. Phys., 45: 547-9(July 15, 1966). (LA-DC-7805).

The elastic properties of polycrystalline $HfC_{0.967}$, $NbC_{0.964}$, $TaC_{0.894}$, and $WC_{1.007}$ were determined at 23°C, and the data were corrected to theoretical density. In units of 10^{12} dyn/cm^2, the Young's moduli are 4.61, 4.88, 5.37, and 6.23; the shear moduli, 1.95, 1.98, 2.16, and 2.63; and the bulk moduli, 2.42, 3.00, 3.44, and 3.29, respectively. The Poisson's ratios are 0.18, 0.22, 0.24, and 0.18, respectively. The specific electrical resistivities (micro-ohm centimeters at 20°C, corrected to theoretical density) are 24.6, 49.1, 25.6, and 17.8, respectively. (auth)

35909 RARE EARTH POLONIDES. Kershner, C. J.; DeSando, R. J.; Heidelberg, R. F.; Steinmeyer, R. H. (Monsanto Research Corp., Miamisburg, Ohio). Contract AT(33-1)-Gen-53. J. Inorg. Nucl. Chem., 28: 1581-8 (Aug. 1966). (MLM-1314J).

Several rare earth polonides were prepared by reaction of Po metal with the rare earth metal or hydride. Syntheses were carried out in compartmented sealed quartz reaction tubes contained in a furnace. Reactions were followed with a gamma scintillation probe, which permitted monitoring of the gamma activity in the reaction chamber. Melting or decomposition points of the reaction products were obtained, and crystallographic data for several of the compounds were obtained by x-diffraction measurements. (auth)

35910 A COMPARISON OF RECENT EXPERIMENTAL MEASUREMENTS OF THE DENSITY AND CRITICAL PROPERTIES OF LIQUID RUBIDIUM AND CESIUM WITH PREVIOUS ESTIMATES BASED ON A GENERAL RELATIONSHIP BETWEEN CHANGE IN DENSITY AND CRITICAL TEMPERATURES OF METALS. Grosse, A. V.

(Temple Univ., Philadelphia). J. Inorg. Nucl. Chem., 28: 1757-60(Aug. 1966).

Density–temperature coefficients of Cs and Rb, as well as critical densities and temperature, were calculated from available measurements. Comparison of experimental results from various investigators showed excellent agreement and established that the law of rectilinear diameter is fulfilled, at least in first approximation, for Cs and Rb. (P.C.S.)

35911 INFLUENCE OF PROCESSING VARIABLES ON THE GRAIN STRUCTURE AND HYDRIDE ORIENTATION IN ZIRCALOY-2 TUBING. Hindle, E. D.; Slattery, G. F. (United Kingdom Atomic Energy Establishment, Springfields, Eng.). J. Inst. Metals, 94: 245-9(July 1966).

The effect on hydride directionality of different processing routes based on modern tube making was studied for the case of Zircaloy-2 tubing and the results were interpreted in terms of grain structure, internal stress, and texture. The processes involved are complex and their influences tend to overlap but usually the final operation in the schedule is of predominant importance in affecting hydride orientation. The formation of radial hydride is associated with radial strain due to an unsupported sinking operation. In the transverse sections, hydride is precipitated radially, circumferentially, and at ~45° to the radial direction. The cause of this macroscopic directionality is related to the presence in the structure of bands of co-oriented grains produced during tube manufacture. This directionality can be removed by subsequent annealing to promote recrystallization and grain growth. Radial hydride is undesirable, since it drastically reduces the ductility and hoop stress to rupture, particularly when it takes the form of long radial platelets. (auth)

35912 RADIOISOTOPE TECHNIQUE FOR THE STUDY OF REFRACTORY/MELT REACTIONS. Snape, E.; Beeley, P. R. (Univ. of Leeds, Eng.). J. Inst. Metals, 94: 258-61(July 1966).

Experiments using ^{95}Zr were performed to determine how the amount of zirconium absorbed by nickel-based alloy melts changed with time, temperature, and pressure. Metal composition was varied in order to study the influences of carbon and titanium in the reaction. Graphs of the results are given. (D.H.M.)

35913 ROLE OF INTERPHASE BOUNDARIES IN SUPERCONDUCTING LEAD–BISMUTH ALLOYS. Kramer, D.; Rhodes, C. G. (North American Aviation Science Center, Thousand Oaks, Calif.). J. Inst. Metals, 94: 261-2(July 1966).

A study to demonstrate quantitatively how the presence of bismuth particles affect the maximum value of the current density (J_c) in Pb–Bi superconductors was undertaken. It was shown that log J_c is proportional to the square root of the number of interphase boundaries per centimeter. (D.H.M.)

35914 HIGH-TEMPERATURE OXIDATION RESISTANCE OF AN YTTRIUM-BEARING 20 PERCENT Cr/25 PERCENT Ni/Nb-STABILIZED AUSTENITIC STEEL IN CARBON DIOXIDE. Francis, J. M.; Whitlow, W. H. (Central Electricity Generating Board, Berkeley, Eng.). J. Iron Steel Inst. (London), 204: 355-9(Apr. 1966).

A 20% Cr/25% Ni/Nb-stabilized austenitic steel alloyed with 0.7 wt % yttrium was oxidized at 750, 850, and 950°C in carbon dioxide. Thermogravimetric measurements were made over the exposure range 0–100 hr at each temperature, together with a structural evaluation of the oxide films formed. Electron probe microanalysis of the steel showed the yttrium distribution to consist of a dispersion of second phase [Y(Ni,Fe)$_9$] particles in an austenite matrix. Internal oxidation of the yttrium content of the second phase material takes place under the above conditions, and the presence of small amounts of the resultant Y_2O_3 phase in the metal/oxide interface can contribute to the improved adhesion of the surface oxide. The presence of yttrium in the film considerably modifies the structure and composition of the surface oxide phases. The kinetic data reflect a decrease in cation diffusion rates, so that even at 940°C parabolic rather than break-away oxidation kinetics are followed. Scale retention on cooling from the reaction temperature is an important feature of the yttrium-bearing 20% Cr/25% Ni/Nb steel. (BBB)

35915 ISOTHERMAL TRANSFORMATION OF γ PHASE ADJUSTED URANIUM IN THE β RANGE. Oestberg, Gustav; Haglund, Bengt Olof; Lehtinen, Boerje; Storm, Lars (Aktiebolaget Atomenergi, Stockholm). J. Microscop., 5: 21-30(Feb. 1966).

Properties of so-called adjusted uranium, i.e., uranium alloyed with 200–500 ppM Fe and 500–1200 ppM Al, depend largely on the dissolution and precipitation of second phase particles. Some information was obtained on the precipitation of second phase particles during isothermal transformation in the β range directly following a solution treatment in the γ range. Two adjusted uranium type alloys, one with 1200 ppM Al, 550 ppM Fe, and 500 ppM C, the other with 900 ppM Al, 350 ppM Fe, and 400 ppM C, as specimens 2 mm thick, were given a solution treatment in the range by annealing at 800°C for 10 min in argon directly followed by isothermal holding at 760, 750, 740, 720, 700, and 680°C for periods ranging from 2 sec to 90 min, interrupted by quenching in water. Based on observations in a light microscope and on thin foils in an electron microscope a temperature vs time diagram for the precipitation of second phase particles was established. These particles were identified by electron diffraction as UAl_2, while U_6Fe was not detected. The morphology of the second phase particles was studied and some differences in comparison with previous studies under nonisothermal conditions were noted. (TCO)

35916 THREE WAYS TO PROTECT GRAPHITE AGAINST HIGH TEMPERATURES. McKelvy, Robert W. (Speer Carbon Co., Niagara Falls, N. Y.). Mater. Design Eng., 63: No. 6, 93-5(June 1966).

It is shown that graphite parts can be used at temperatures up to 3000°F by controlling the atmosphere and by using protective coatings and specially processed grades of material. (M.C.G.)

35917 ELECTRICAL CONDUCTION IN URANYL PHTHALOCYANINE. Kronick, P. L.; Bloor, J. E.; Labes, M. M. (Franklin Inst. Research Lab., Philadelphia). Mol. Crys., 1: 113-23(Jan. 1966).

The spectrum of uranyl phthalocyanine (UO_2Pc) dissolved in 1,3,5-trichlorobenzene is given. The same spectrum in solution is obtained whether the starting solid solute is the blue or green form. The major peak of its absorption spectrum is in the near infrared and the compound shows a strong photocurrent response in this region. In the dark, it is one of the most conductive of the phthalocyanines, but its activation energy is 0.87 ev, about the same as metal-free phthalocyanine. Single crystals exhibit a photoconductive gain about 1000-fold greater than the sublimed films, probably because of more efficient carrier transport through the more perfect crystal lattice. UO_2Pc in the dark has a resistivity of 3×10^{10} Ω-cm, determined at room temperature on blue single crystals. Insensitivity to the presence of oxidizing or reducing vapors was also observed. (TCO)

35918 STUDIES ON THE THREE-COMPONENT SYSTEM CERIUM–THORIUM(URANIUM)–SILICON. Benesovsky, F.; Nowotny, H.; Rieger, W.; Rassaerts, H. (Metallwerk Plansee AG, Reutte, Austria). Monatsh. Chem., 97: 221-9(1966). (In German).

Structural data (lattice constants) are tabulated for the following cerium, thorium, and uranium silicides: Ce_2Si, Ce_3S_2, $Ce_{1.2}Si$, CeSi, $CeSi_{<2}$, $CeSi_2$, Th_3Si_2, ThSi, Th_3Si_5, β-Th_6Si_{11}, α-Th_6Si_{11}, α-$ThSi_2$, β-$ThSi_2$, U_3Si, U_3Si_2, USi, α-USi_2, βUSi_2, and USi_3. X-ray studies were carried out on the ternary system Ce-Th(U)-Si using sintered specimens. A phase diagram of the binary system cerium-silicon was established on the basis of additional metallographic findings and melting point measurements. Besides the already described phases Ce_3Si_2, CeSi, $CeSi_{<2}$, and $CeSi_2$, two new

compounds $Ce_{\sim 2}Si$ and $Ce_{\sim 1.2}Si$ were detected. The crystal structure of Ce_3Si_2 was confirmed, the lattice parameter being determined. The ternary system Ce-Th-Si is characterized by the presence of three continuous solid solution series $(Ce,Th)_3Si_2$, $(Ce,Th)Si$, and $(Ce,Th)Si_2$. In contrast, the mutual solubility of the Ce- and U-silicides in the system Ce-U-Si is low. (BBB)

35919 SINGLE CRYSTAL GROWTH AND POLYMORPHY OF Nb_2O_5 AND Ta_2O_5. Moser, Rene. Schweiz. Mineral. Petrogr. Mitt., 45: 35-101(1965). (In German).

Results are reported on growth of single crystals of Nb_2O_5 and Ta_2O_5 using the Verneuil and hydrothermal methods as well as chemical transport reactions. Crystals belonging to the following phases were obtained: α- and γ-Ta_2O_5, α-, β-, γ-, ζ-, η-Nb_2O_5, and also some suboxides of Nb_2O_5. ζ and η are two new phases of Nb_2O_5. Monocrystals of β- and γ-Nb_2O_5 are described for the first time. In experiments with a plasma torch, the constitution of Nb_2O_5 and Ta_2O_5 powders after passing through the plasma was investigated. Results indicate that the transformation from the low-temperature to the high-temperature modification of Nb_2O_5 may be reversible under high pressure. X-ray analysis showed that the low-temperature modification of Ta_2O_5 may occur in several states which differ in the position of weak powder lines. X-ray investigations at high temperatures showed that at high temperatures an equilibrium dependent in O_2 pressure between γ- and α-Ta_2O_5 is attained, whereby γ is stabilized by increasing O_2 pressure. Thus, γ is the only modification of stoichiometric Ta_2O_5 which is stable up to the melting point, while α is formed as a suboxide. β-Nb_2O_5 normally occurs together with α-Nb_2O_5; materials free of α appear to be stabilized by impurities or vacancies; single crystal photographs indicate a two-dimensional disorder of the lattice. (TCO)

35920 THERMAL CONDUCTIVITY AND ELECTRICAL RESISTIVITY OF SAMARIUM AT LOW TEMPERATURES. Arajs, Sigurds; Dunmyre, G. R. (U. S. Steel Corp., Monroeville, Pa.). pp 63-74 of Solid State Session P-1. Book Two [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

Thermal conductivity and electric resistivity of Sa were measured from 5 to 200°K and from 5 to 300°K, respectively. Two anomalies, one at 12 ± 1°K and another at 106 ± 1°K, are observed, resulting from an order-order magnetic transformation and an antiferromagnetic-paramagnetic transition, respectively. The Lorentz function is found to be larger at any temperature than that expected for pure electronic thermal conductivity. This implies that there is some phonon and possibly also some magnon thermal conductivity in Sa at low temperatures. The magnetic moment disorder electric resistivity of Sa is determined to be 39.0 ± 0.5 $\mu\Omega$ cm, in fair agreement with the value to be expected from theoretical considerations. (auth)

35921 EFFECTS OF DILUTE RARE-EARTH ADDITIONS ON THE ELECTRICAL CONDUCTIVITY OF CERIUM AT LOW TEMPERATURES. Clinard, F. W.; Elliott, R. O.; Miner, W. N. (Univ. of California, Los Alamos, N. Mex.). pp 29-42 of Solid State Session P-3. Book Six [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

Two atomic percent of the various trivalent rare earths was dissolved in Ce, and the electrical resistivities of these dilute binary alloys evaluated in the range 1.5 to 297°K, in order to determine whether the various solute magnetic properties might be reflected in resistivity measurements. It was found that the γ and β phases at room temperature showed a roughly linear dependence of resistivities on atomic number of solute species, with a slight effect attributed to solute-solvent atomic size mismatches. At 4°K the resistivities of predominantly α phases were found to be influenced by the presence of small amounts of β, and predominantly β phases by small amounts of α. Spin-disorder resistivities for β phase were found to be a nearly linear function of atomic number of solute, and did not clearly reflect the influence of any solute magnetic parameters. A slight decrease in spin-disorder resistivities was noted in the direction of the heavier rare earth solutes. (auth)

35922 SPIN DEPENDENCE OF THE ELECTRICAL RESISTIVITIES OF GADOLINIUM ALLOYS. Chen, C. W. (Westinghouse Research Labs., Pittsburgh). Contract AF49(638)-1245. pp 43-50 of Solid State Session P-3. Book Six [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

The electric resistivities of various intra-rare-earth alloys of Gd at 4.2, 77, and 298°K are discussed with respect to the theory. Two spin effects are shown in the scattering of the conduction electrons. (auth)

35923 LEED STUDIES OF THORIUM ADSORPTION ON TUNGSTEN. Estrup, P. J.; Anderson, J.; Danforth, W. E. (Franklin Inst., Swarthmore, Pa.). Surface Sci., 4: 286-98(1966).

Structural arrangement of Th atoms adsorbed on a W (100) surface was investigated by means of low-energy electron diffraction (LEED) techniques. As the coverage of Th was increased a series of three distinct surface structures were observed which exhibited a decreasing crystallographic relation with the substrate lattice. Epitaxial growth appeared to set in for coverages above one monolayer. Occurrence of these structures was correlated with the observed changes in the work function of the system. Models for the surface structures are presented and are used to discuss the interaction between the surface atoms, as well as the appearance of disordered structures. (auth)

35924 EFFECTS OF VALENCE AND SIZE UPON THE ALLOTROPIC PHASE BOUNDARIES OF ZIRCONIUM-BASED BINARY SYSTEMS. Uy, J. C. (Maggs Research Center, Watervliet, N. Y.); Burr, A. A. Trans. Met. Soc. AIME, 236: 1009-11(July 1966).

A quantitative relation between the allotropic phase boundaries of zirconium-base binary systems and the solute metallic valence is shown through an intermediate thermodynamic parameter. A simplified equation relating this parameter to the phase boundaries is briefly reviewed, and data from the literature are used to show the relation of this parameter to the solute metallic valence. (auth)

35925 TWINNING AND BRITTLE FRACTURE IN MOLYBDENUM. Reid, C. N.; Gilbert, A.; Hahn, G. T. (Battelle Memorial Inst., Columbus, Ohio). Contract AF 33(657)-7376. Trans. Met. Soc. AIME, 236: 1024-30 (July 1966).

An evaluation was made of the possible causal relation between twinning and fracture in molybdenum. For both single and polycrystalline material no instance of twin-induced fracture was observed. Instead brittle fracture was found to be slip-induced at heterogeneities. For single-crystal material, the yield stress in compression and the fracture stress in tension obey a similar angular relation, which follows approximately a $1/\cos^2\theta$ law, where θ is the angle between the specimen axis and the nearest {100} plane. This similarity between yield and fracture behavior casts doubt on the interpretations made previously that a $1/\cos^2\theta$ relation supports a critical normal fracture stress criterion. (auth)

35926 CHEMICAL DIFFUSION IN THE COLUMBIUM–TUNGSTEN SYSTEM. Hehemann, R. F. (Case Inst. of Tech., Cleveland); Leber, S. Trans. Met. Soc. AIME, 236: 1040-4(July 1966).

Diffusion coefficients for the Nb–W system were measured using couples prepared from polycrystalline, commercially pure metals. The diffusion coefficients, measured in the temperature range between 1700 and 2300°C, decreased exponentially as the tungsten concentration was increased from 0 to 50 at. %, then decreased abruptly at higher concentrations. A decrease of two orders of magnitude was observed over the entire compositional range. The diffusion coefficients were in the range defined by the self-diffusion coefficients of the individual elements, in-

dicating their general validity. An activation energy of 60,500 cal per mole was measured for the 20% W composition. Such low values, when compared with energies over 100,000 cal per mole for the pure constituent elements, indicated that transport mechanisms more rapid than volume diffusion were contributing substantially to interdiffusion. Difference should, therefore, be expected between these data and the intrinsic diffusion coefficients. These differences should be significant in the kinetics of transport phenomena in practical systems. (auth)

35927 PRECIPITATION OF NITROGEN FROM SOLID SOLUTION IN Cr–35 AT. PERCENT Re. Klein, Mark J. (Battelle Memorial Inst., Columbus, Ohio). Contract W-7405-eng-92. Trans. Met. Soc. AIME, 236: 1044-9 (July 1966).

The precipitation of nitrogen in quenched and aged Cr-35 at. % Re was followed by internal-friction and electrical-resistivity measurements. It is shown that the precipitation kinetics of nitrogen from solution are many orders of magnitude lower in this alloy than in chromium. The reluctance of nitrogen to precipitate from solution can be attributed to the compositional readjustments required in the vicinity of a chromium nitride particle for growth to occur. (auth)

35928 SYSTEM TITANIUM–ZIRCONIUM. Farrar, Paul A.; Adler, Sanford (New York Univ.). Contract AF 33(657)-7684. Trans. Met. Soc. AIME, 236: 1061-4 (July 1966).

The Ti–Zr system was reinvestigated using both metallographic and x-ray-diffraction techniques. It was found that titanium and zirconium are soluble in all proportions in both the α and β phases. The minimum in the α/β transformation was found at 50 at. % and 535°C. (auth)

35929 X-RAY DIFFRACTION STUDY OF DEFORMATION OF Nb–Re ALLOYS. Aqua, E. N. (Westinghouse Electric Corp., Pittsburgh); Wagner, C. N. J. Trans. Met. Soc. AIME, 236: 1085-9(July 1966).

The bcc alloys of the terminal solid solution of rhenium in niobium were investigated by x-ray-diffraction methods. Analysis of the broadening of the powder pattern peaks from the niobium-rich alloys, cold-worked by filing, showed evidence for faulting on (211) planes. The alloys with larger rhenium concentrations were brittle, and fractured when filed. Analysis of the shapes of the diffraction profiles from powders (produced by hammering with steel plates) of these brittle alloys indicated that the broadening was due predominantly to platelets bounded by cube planes. This result was consistent with the Laue patterns from single-cleavage facets which showed evidence for cleavage fracture on {100} planes. (auth)

35930 EFFECTS OF VANADIUM, TITANIUM, HAFNIUM, AND ZIRCONIUM ON RECRYSTALLIZATION OF MOLYBDENUM. Gol'tsev, V. P. Vestsi Akad. Navuk BSSR, Ser. Fiz. Tekh. Navuk, No. 4, 53-6(1965). (In Russian).

Molybdenum alloy sheet samples containing 0.1 to 0.5% Zr, 0.05 to 0.5% Hf, 0.2 to 0.7% Ti, or 0.4 to 1.0% V were prepared by hot rolling at a temperature of 1173°C with a deformation of ~70%. The sheet samples were then annealed in a vacuum furnace at temperatures from 1173 to 1873°K in order to determine the beginning and end of the recrystallization temperature by examination under a microscope or by x ray. An addition of 0.1 to 0.2 wt % of zirconium or hafnium increased the recrystallization temperature of molybdenum to about 1500°K, while 1% V raised the recrystallization temperature only to about 1325°K. An electron microscope study showed that the alloys were dispersion strengthened due to the presence of a large number of round inclusions having a size of 0.1 to 0.5 μ. Most of the second phase appeared to exist in oxide form. (TTT)

35931 SYNTHESIS AND PROPERTIES OF HEAVY METAL SOAPS. Mehrotra, R. C. (Univ. of Rajasthan, Jaipur, India). Wiss. Z. Friedrich-Schiller-Univ. Jena, Math.-Naturwiss. Reihe, 14: 171-80(1965).

General methods for preparing heavy metal soaps are reviewed. Special emphasis is placed on soaps highly susceptible to hydrolysis, such as those of aluminum, titanium, zirconium, thorium, and some lanthanide elements. New methods are described for the preparation of these derivatives. Properties of these soaps, including molecular association, tendency of gelation, and thermogravimetric behavior, were investigated and discussed in the light of their proposed structures. The precipitation method was used for the preparation of soaps of some lanthanide elements: lanthanum, cerium, praseodymium, and neodymium. Soaps of metals other than alkalis are soluble in organic solvents but insoluble in water. They are not true organometallic compounds and are characterized by M–O–C bonds. Soaps of alkaline earth metals, magnesium, zinc, nickel, cobalt, copper, and aluminum were investigated in greater detail. (TCO)

Radiation Effects

See also CHEMISTRY — Radiation Chemistry

35932 (LA–3501) RADIATION DAMAGE PRODUCTION OF INTERSTITIAL DEFECTS IN IONIC HALIDE CRYSTALS. Pretzel, F. E.; Anderson, J. L. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). Oct. 1964. Contract W-7405-eng-36. 38p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Low-temperature x-ray diffraction was used to study interstitial formation by observing lattice changes in β-irradiated ionic halide crystals at liquid nitrogen temperature. The observed unit-cell expansions of nine alkali halides (LiF, LiCl, NaCl, NaBr, NaI, KCl, KBr, KI, CsI), and of CaF_2 and AgCl indicate that interstitial concentrations from 10^{19} to 4×10^{20} defects/cm^3 are attained by intense bombardment. No detectable change in lattice parameter was found for four non-halogen crystals (LiH, MgO, TiC, Si). The predominant interstitial species in various irradiated alkali halides have been inferred from studies of color centers. Optical and x-ray diffraction data show that Frenkel-type disorder is the principal form of radiation damage produced in ionic halide crystals. Lattice recovery after prolonged irradiation indicates that Frenkel disorder may change to Schottky disorder by a diffusion process. Several unique range and dose-rate effects are found in small (~100 μ) crystals exposed to short-range ($\leq$3 μ) β particles. More accurate determinations of the lattice expansion of LiT are reported that verify the formation of Frenkel-type (interstitial He^3) at 80°K and Schottky-type disorder at 300°K. (auth)

35933 (N–66–18156) A STUDY OF THE BLISTERING OF METAL SURFACES BY SOLAR-SYSTEM IONS. Interim Report. Cooley, J. A. (Avco Corp., Tulsa, Okla.). Dec. 1, 1965. Contract NASw-1203. 31p. (NASA-CR–70519; TR–65-363-2). CFSTI $2.00 cy, $0.50 mn.

Conditions are specified under which H in Al, introduced by proton irradiation, will produce surface blistering. Also, an investigation is made of the mechanisms of the processes involved and the dependence of the phenomenon on material structure and preparation procedures. Consideration is given to basic parameters such as the penetration depth and distribution of protons in Al, the solubility, mobility, and the effects of lattice defects, impurities, and the oxide surface film on the distribution and transport of H in Al. Theoretical questions involved are the mechanism of H transport in the metal and evolution of this gas from the metal, the role of lattice defects, impurities, and the oxide surface film in the transport and evolution processes, and the mechanism of blister formation. (STAR)

35934 (NAA–SR–128) PAPERS PRESENTED AT THE RADIATION DAMAGE CONFERENCE, AT PITTSBURGH, PA., MARCH 6 AND 7, 1951. Bowen, D. B.; Carter, R. L.; Dienes, G. J. (North American Aviation, Inc., Downey, Calif.). Oct. 30, 1951. Contract AT(11-1)-Gen-8. 65p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Three papers presented at the Radiation Damage Conference are given. Separate abstracts were prepared for the papers. (M.C.G.)

For abstracts of individual papers see: 35935–35937.

35935 (NAA-SR-128, pp 5-35) RECENT EXPERIMENTAL WORK AT NAA ON ELECTRIC, MAGNETIC, THERMAL AND MECHANICAL PROPERTIES OF IRRADIATED GRAPHITE. Carter, R. L. (North American Aviation, Inc., Downey, Calif.).

Several different types of graphite were irradiated and studied. The effects of radiation on moduli of elasticity, internal friction, tensile strength, thermal conductivity, electric conductivity, thermoelectric power, Hall effect, magnetic susceptibility, chemical reactivity, stored energy, and x-ray diffraction patterns were studied. Data are presented in graphs. (M.C.G.)

35936 (NAA-SR-128, pp 36-45) AN INTERPRETATION OF RADIATION DAMAGE IN GRAPHITE. Bowen, D. B. (North American Aviation, Inc., Downey, Calif.).

The model developed for radiation damage in graphite is characterized by three different lattice distortions: single interstitial carbon atoms between hexagonal planes, lattice vacancies, and groups of probably 6 carbon atoms located at the crystallite boundaries. The exposure dependence of the temperature coefficient of electric resistance was confirmed. Annealing of radiation damage was also considered. (M.C.G.)

35937 (NAA-SR-128, pp 46-65) ANNEALING OF COLD WORK AND RADIATION DAMAGE IN AuCu AND IN Cu. Dienes, G. J. (North American Aviation, Inc., Downey, Calif.).

Cold work and thermal spike analogies of radiation damage are reviewed. The effects of cold work, heat treatment, and radiation on the rate of ordering in the AuCu alloy were compared. Radiation damage was shown to have a large effect on the rate of ordering. Cold work and radiation damage in copper annealed in different manners. (M.C.G.)

35938 DIMENSIONAL VARIATIONS IN GRAPHITE UNDER THE EFFECT OF NEUTRON IRRADIATIONS. Rappeneau, J. (CEN, Saclay, France). Bull. Inform. Sci. Tech. (Paris), No. 105, 17-27(June 1966). (In French).

Polycrystalline artificial graphites subjected to neutron irradiation undergo dimensional changes that depend on dose, irradiation temperature, and physical characteristics of the material (crystallite orientation, porosity, degree of graphitization, thermal expansion coefficient, etc.). The thermal expansion coefficients of polycrystalline graphite had a predominant influence on radioinduced dimensional changes. Using a semiphenomenological theory these changes can be predicted, under certain conditions and up to doses of the order of 2×10^{22} ncm^{-2} (irradiation temperatures 200 to 450°C), from thermal expansion data. After outlining the bases of this theory, the results obtained on different graphites irradiated in different reactors are described. The approximations of the theory are given, together with the physical characteristics desirable for the graphite making up reactor stacks. (auth)

35939 NEW ANNEALING METHOD FOR THE PILE G1 GRAPHITE. Savineau, M. (CPP, Marcoule, France). Bull. Inform. Sci. Tech. (Paris), No. 105, 29-37(June 1966). (In French).

The G-1 coolant circuit is designed in such a way that the introduction of cold air takes place in the maximum flux zone. This arrangement encourages the creation of defects in the graphite crystal lattice as a result of neutron action. These defects can be "healed" by heating the graphite; this is the operation of baking, which can be performed in various ways. The development of this concept is described. (auth)

35940 ACTION OF HIGH-ENERGY RADIATIONS ON INSULATORS. POINT OF VIEW OF THE ELECTRIC-ENGINEER. Coelho, R.; Belloc, P. Bull. Inform. Sci. Tech. (Paris), No. 105, 57-76(June 1966). (In French).

The main processes of degradation of solid organic insulators by high energy radiation are reviewed, and electrical properties of these materials, during and after irradiation are described. The behavior of cables and condensers, based on the use of insulators is considered. (auth)

35941 INFLUENCE OF IRRADIATION ON THE TENSILE PROPERTIES OF THE ALUMINUM ALLOY 6061. McCoy, H. E. Jr.; Weir, J. R. Jr. Nucl. Sci. Eng., 25: 319-27(1966). (ORNL-P-1834).

It was shown that the aluminum alloy 6061 in the fully annealed, cold-worked, and age-hardened conditions undergoes very small changes in the tensile properties as a result of neutron irradiation to doses on the order of 10^{19} fast n/cm^2(>2.9 Mev) and 10^{20} thermal n/cm^2. At irradiation temperatures above 115°C, no changes in properties are observed. The small property changes observed when the material is irradiated at 43°C are mostly annealed out after ½ h at 200°C. These changes are rationalized in terms of the precipitate particles present in the alloy and the mobility of the irradiation-induced defects. (auth)

35942 LATTICE DEFECTS IN NEUTRON-IRRADIATED αCu SOLID-SOLUTION ALLOYS. Koppenaal, T. J.; Yeh, W. C. T.; Cotterill, R. M. J. (Argonne National Lab., Ill.). Phil. Mag., 13: 867-71(Apr. 1966).

The lattice defects in neutron irradiated αCu–Al, αCu–Ga and αCu–Ge solid solution alloys were observed by transmission electron microscopy and the defect structures are compared with neutron irradiated copper. Alloys with 0.5 at. % of either aluminum, gallium or germanium show both large resolvable dislocation loops and small "black spots"; the same defects are seen in irradiated copper. Alloys ≥5 at. % solute show only the small "black spots". The effect of these higher solute alloys in supressing the formation of the large resolvable loops was also observed after alpha particle irradiation. Since the large loops are believed to be interstitial in nature, the results are explained on the basis of interstitial-solute atom binding. (auth)

35943 ELECTRON IRRADIATION OF URANIUM AT 7 DEG K. Jousset, J. C. (Centre d'Etudes Nucleaires, Fontenay-aux-Roses, France); Lucasson, A.; Lucasson, P. Phil. Mag., 13: 887-97(May 1966).

Two samples of uranium were irradiated at a temperature of 7°K with 1.7-Mev electrons. The increase of the electrical resistivity as a function of the total electron flux was measured. It was found that the curve of damage produced versus electron flux exhibits a positive curvature. Isochronal annealings performed after irradiation show that the low temperature annealing behavior of electron produced defects in uranium is identical to that of the lattice defects produced by low temperature quenches. The implications of these results are discussed. (auth)

35944 NEUTRON RADIATION DAMAGE IN TUNGSTEN SINGLE CRYSTALS. Lacefield, K.; Moteff, J.; Smith, J. P. (General Electric Co., Cincinnati). Contract AT(40-1)-2847. Phil. Mag., 13: 1079-81(May 1966).

Tungsten single crystals were neutron irradiated to exposures of 0.46, 2.4, 4.0 and 7.3×10^{19} nvt (E > 1 Mev) and examined by transmission electron microscopy. Defect clusters, observed after 2.4×10^{19} nvt, increased in size and concentration with increasing neutron exposure. One specimen irradiated to 7.3×10^{19} nvt was subsequently annealed for one hour at 1090°C in argon. The defect cluster density was substantially reduced and some loops were produced. Neither the loops nor the defect clusters were analyzed, but are presumed to be interstitial in nature. (auth)

35945 SOME POSSIBLE USES OF A PULSE METHOD FOR DETERMINATION OF ELASTIC CONSTANTS. Mukhin, L. M. Primenenie Ul'traakust. Issled. Veshchestva, No. 18, 249-52(1963). (In Russian).

A pulse method for determining elastic constants is presented. This method is based on measurement of the rate of propagation of ultrasonic waves in the sample, and was tested in a water-moderated water-cooled reactor on Cu and graphite samples. The advantages of the method are that it permits reliable control of temperature in the active

part of the sample, the simultaneous determination of all elastic constants on the same sample, removal of the data unit from the active zone, and the study of radiation kinetics. (TCO)

35946 ALTERATIONS OF THE CRYSTAL STRUCTURE OF SOME OXIDES, CARBONATES, AND TITANATES BY NEUTRON IRRADIATION. Hauser, O.; Schenk, M. (Zentralinstitut fuer Kernforschung, Rossendorf, Ger.). Wiss. Z. Humboldt-Univ. Berlin, Ges. Sprachwiss. Reihe, Beil. I, 13: 59(1964). (In German).

Several minerals possessing different crystalline modifications were irradiated with doses of up to 2.8×10^{19} neutrons to determine the existence of phase transformations induced by irradiation. Minerals examined were quartz (TT phase), brookite, rutile, $BaTiO_3$, perovskite, red lead oxide, yellow lead oxide, aragonite, calcite, $SrCO_3$ (TT), and strontianite. In the case of $BaTiO_3$, a radioinduced phase transformation (tetragonal → cubic) was observed; the thermally produced cubic phase was not metastable at room temperature, while the radioinduced cubic phase was resistant to extensive temperature treatment. Brookite and quartz were nearly metamictized; the other materials showed no changes in structure. Compounds with thermally displacive transformations are more likely to rearrange under radiation than those with reconstructive transformations. Radiation effects may be explained by point defects or aggregations of these. (BBB)

35947 EFFECTS OF HIGH-ENERGY RADIATION ON THE ELECTRICAL PROPERTIES OF EPOXY RESINS. Beine, H. Ilmenau, Ger., Technische Hochschule, 1965. 98p. $2.00 Gmelin, AED-Diss. 65-304.

Thesis.

Epoxy resin samples were irradiated with a 1.5 Mev electron accelerator (dose rate 10^5 rad/sec) with total doses between 10^6 and 10^9 rad. After-irradiation coloring, conductivity, surface conductivity, breakdown voltage, and dielectric constant were determined. The samples are destroyed with 10^9 rad if they are heated over 80°C during irradiation. Conductivity is decreased but returns to normal values after some days. Results indicate, that lower molecular compounds which are gradually absorbed are produced by irradiation. (auth)

PHYSICS

General

35948 (AD-635253) DIRAC MONOPOLE SEARCH. Berkowitz, Harry; Kronenberg, Stanley (Army Electronics Labs., Fort Monmouth, N. J.). May 1966. 33p. (ECOM-2710). CFSTI $2.00 cy, $0.50 mn.

The general aspects of the Dirac monopoles are discussed. A novel experiment is proposed by means of which one could prove the existence of the monopoles with magnetic charge g = 137 e provided that the cross section for their production is larger than 10^{-38} cm^2 above the required threshold energy. (auth)

35949 (AED-C-12-13(Pt.3)) BIBLIOGRAPHIES IN NUCLEAR SCIENCE AND TECHNOLOGY. Section 12: Nuclear Science Literature of the Eastern Countries. Number 13. High-Energy Physics. Enssien, Benno (comp.) (Zentralstelle fuer Atomkernenergie-Dokumentation, Gmelin-Institut fuer Anorganische Chemie und Grenzgebiete, Frankfurt am Main (West Germany)). Apr. 1966. 198p. Dep. mn.

A list is presented of approximately 750 papers dealing with various aspects of quantum field theory, Regge poles and related topics, cosmic radiation, elementary particles, and radiation detection instruments and methods. (M.O.W.)

35950 THEORY OF AN OMEGATRON FOR DETECTING POSITIVE AND NEGATIVE IONS. Shabad, B. I. Zh. Tekh. Fiz., 36: 720-5(Apr. 1966). (In Russian).

The equations of motion of a charged particle in crossed uniform magnetic and rotating electric fields are solved and the solutions are discussed with particular attention to those for which the condition for cyclotron resonance is nearly satisfied. The calculations were undertaken to explore the possible advantages of employing a rotating electric field in place of the usual oscillating field in an omegatron. For an ion to absorb considerable energy from the rotating electric field and thus to be brought into a Larmor orbit of large radius it is necessary not only that it have an appropriate mass so that its Larmor frequency is close to the frequency of the rotating electric field, but also that its Larmor rotation be in the same direction as the rotation of the electric field. Thus the rotating-field omegatron can distinguish between ions of different mass, as can the ordinary omegatron, and also distinguish between positive and negative ions. The mass resolution of the rotating-field omegatron is shown to be equal to that of the ordinary omegatron. The terms in the equation of the trajectory that depend on the initial position and velocity of the ion are smaller in the case of a rotating electric field than in the case of an oscillating field. Since the importance of these terms increases with increasing ion mass, the rotating-field omegatron can be expected to have a higher resolution in the high-mass region than the ordinary omegatron. The rotating electric field can be produced by applying h-f voltages 90° out of phase to two perpendicular pairs of parallel plane electrodes. (ATD)

Accelerators

Refer also to abstract 36124.

35951 (ANL-7171) ARGONNE CYCLOTRON: ^3He CONVERSION. Ramler, W. J.; Benaroya, R.; Parker, G. W.; Aron, J. (Argonne National Lab., Ill.). Feb. 1966. Contract W-31-109-eng-38. 29p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The Argonne 60-inch cyclotron has been operating since 1952 with projectiles limited to a charge-to-mass (Q/M) ratio of 1/2, i.e., D^+, H_2^+, $^4He^{2+}$, and $^6Li^{3+}$. The cyclotron was modified to permit acceleration of $^3He^{2+}$ ions. Required modifications were accomplished in the period from May to August, 1964. These modifications, along with the ^3He gas-recovery system and resulting accelerator operation, are discussed. (auth)

35952 (BNL-10297) SUPERCONDUCTING AG SYNCHROTRON MAGNETS. Dahl, P. F.; Jellett, K.; Parzen, G. (Brookhaven National Lab., Upton, N. Y.). May 25, 1966. Contract AT-30-2-GEN-16. 11p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The design of superconducting magnets differs from that of conventional iron magnets in that the shape of the magnetic field is determined primarily by the current distribution rather than by the presence of the iron pole face. The problem of finding current distributions to obtain the magnetic field desired in AG synchrotron magnets was investigated. The results are discussed. (M.O.W.)

35953 (CEA-R-2936) ETUDE DE LA PULSATION D'UN ACCELERATEUR D'IONS FOURNISSANT DES IMPULSIONS D'UNE DUREE DE 20 NANO-SECONDES. (Study of the Pulsation of an Ion Accelerator Furnishing 20-Nanosecond Pulses). de Cosnac, Bertrand (Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires). [1965]. 57p. Dep. mn.

Thesis. Submitted to Paris Univ., France.

In order to measure fast neutron spectra by the time-of-flight method, a pulsed ion-source which has been placed on a 600 kv electrostatic accelerator was studied. Examined successively were the ion-source itself, its extraction device, the focusing equipment, and the pulsation system constituted by a slit which is swept by the beam. Using this ion-source it is possible to obtain a direct current of deuterons of over 800 μA, and clouds having a duration which can be adjusted to between 15 and 40 nanoseconds. (auth)

35954 (CEAL-TM-147) ACCELERATOR DEVELOPMENT PROGRAM. Livingston, M. Stanley (Cambridge Electron Accelerator, Mass.). Jan. 5, 1965. Contract AT(30-1)-2076. 16p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A program of technical developments and studies planned for the Cambridge Electron Accelerator is discussed. The program includes increased beam intensity, production and acceleration of positrons, and the storage of circulating beams. (B.G.D.)

35955 (JINR-P-2706) RASCHET USKORENIYA ELEKTRONOV DO 30 Mev PRYAMOUGOL'NYMI REZONATORAMI V MIKROTRONE. (Calculation of Electron Acceleration up to 30 Mev by Rectangular Resonators in Microtron). Matora, I. M.; Merkulov, L. A.; Shelontsev, I. I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1966. 31p. Dep. mn.

Results are presented of numerical calculations of electron acceleration up to 30 Mev in the microtron at the JINR. The phase stability region for the so-called second mode of acceleration is specified as well as the distribution of phase losses of the beam along the orbits. The influence of the microwave magnetic field on the beam parameters extracted from the microtron is cleared up. The rectangular resonator with a square cross-section chosen according to calculations allowed to obtain pulsed currents of the extracted beam to be 60 ma at the electron energy of 30 Mev. (auth)

35956 (JINR-P-2730) OPREDELENIE USKORYAYUSHCHEGO NAPRYUZHENIYA V SINKHROTSIKLOTRONE S ISPOL'ZOVANIEM ZAVISIMOSTI INTENSIVNOSTI OT CHASTOTY MODULYATSII. (Determination of the Synchrocyclotron Accelerating Voltage Using the Intensity Dependence on the Frequency Modulation). Safonov, A. N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1966. 10p. Dep. mn.

A method is described for determination of the accelerating voltage on the synchrocyclotron dee under the oper-

ating conditions using the intensity dependence on the frequency modulation. The accelerating voltage in dependence on the direct voltage applied to the anode oscillator tubes is given for the JINR synchrocyclotron. (auth)

35957 (LA-DC-7775) FAULT-PROTECTION SYSTEM FOR LINAC RF AMPLIFIERS. Doss, James D. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [nd]. Contract W-7405-eng-36. 10p. (CONF-660528-3). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 9th Modulator Symposium, Fort Monmouth, N. J.

A fault protection system is described which will be employed as a subsystem in r-f amplifier modules, consisting of coaxitron power amplifiers, modulators, power supplies, and drive amplifiers, and designed to protect basically the expensive vacuum tubes in the module. (B.G.D.)

35958 (LAL-1159) RAPPORT D'ACTIVITE, 15 OCTOBRE 1965-15 AVRIL 1966. (Report of Activity, October 15, 1965-April 15, 1966). (Laboratoire de l'Accelerateur Lineaire, Univ. de Paris, Orsay (France)). June 1966. 62p. Dep. mn.

The improvement and utilization of the accelerator are summarized, together with research progress in nuclear physics, nuclear spectroscopy, pion physics, and storage rings. Development of associated experimental equipment and radiation control are reported. A bibliography of the publications during this period is appended. (J.S.R.)

35959 (LNF-66/18) A MAGNETIC DETECTOR FOR ADONE. Note No. 317. O'Neill, G. K. (Laboratori Nazionali di Frascati, Comitato Nazionale per l'Energia Nucleare (Italy)). Apr. 1, 1966. 19p. Dep. mn.

The development of a general purpose magnetic detector, subtending a large fraction of 4π in solid angle is discussed. Topics included are design criteria, momentum resolution requirements, calculation of errors in momentum measurements, scaling laws for magnet size, magnet geometry, coil specifications, spark chambers and photography, analysis background, and cost estimations. (B.G.D.)

35960 (NP-16169) MAGNETO-OPTICAL DEVICE FOR LINAC QUADRUPOLE ALIGNMENT. Warner, D. J.; Webb, J. S. (Rutherford High Energy Lab., Science Research Council, Chilton (England)). [nd]. 8p. Dep. mn.

The description and operation of a magneto-optic device for alignment of quadrupole magnets in linear accelerators are presented. (B.G.D.)

35961 (ORO-3398-4) THE TEXAS A AND M VARIABLE ENERGY CYCLOTRON; PROGRESS AND STATUS, JANUARY 1966. McFarlin, W. A.; McIntyre, J. A.; Nowak, M. A.; June, M. N.; Hardeman, L. B. (Texas Agricultural and Mechanical Univ., College Station). Contract AT(40-1)-3398. 4p. (CONF-660611-2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Society of Applied Spectroscopy Meeting, Chicago.

A progress and status report on the Texas A & M Variable Energy Cyclotron is presented which includes its general objectives, description, modifications, budget, schedules, building description, and active and planned research programs. (B.G.D.)

35962 (ORO-3398-5) UNIQUE FEATURES OF THE TEXAS A AND M VARIABLE-ENERGY CYCLOTRON. McFarlin, W. A. (Texas Agricultural and Mechanical Univ., College Station. Cyclotron Inst.); Goerz, D. J. Jr. (Bechtel Corp., San Francisco, Calif.). [1962]. Contract AT(40-1)-3398. 8p. (CONF-660510-13). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Isochronous Cyclotrons, Gatlinburg, Tenn.

Some of the design, engineering, construction and procurement details of the Texas A & M University Variable Energy Cyclotron (TAMVEC) are described. (B.G.D.)

35963 (RHEL-R-115) ANALYSIS OF ION BEAMS FROM A MERCURY POOL ARC SOURCE. Trowbridge, C. W.; Allen, N. (Rutherford High Energy Lab., Science Research Council, Chilton (England)). Sept. 1965. 40p. Dep. mn. BIS $1.10. HMSO 5s. 6d.

The identification of ion beams from the mercury pool arc source designed for the Oxford Electrostatic Accelerator were determined. The effect of vapor traps on beam composition was investigated and the ratios of useful beam to impurity beams measured. (auth)

35964 (RHEL/R-122) FEASIBILITY STUDY OF A 15- TO 70-Mev SEPARATED-ORBIT CYCLOTRON AS A BOOSTER INJECTOR. Barnfield, R. W.; Billinge, R.; Coupland, J. H.; Louth, J. C.; Mayhook, A. R.; Planner, C. W.; Russell, F. M.; Swain, J. H.; West, N. D. (Rutherford High Energy Lab., Science Research Council, Chilton (England)). June 1966. 89p. Dep. mn. BIS $2.40. HMSO 12s.

A feasibility study was made on a separated orbit cyclotron (SOC) for use as a booster injector for Nimrod. The design and economics aspects of the SOC were considered. (M.O.W.)

35965 (SLAC-PUB-181) ACCURATE PHASE LENGTH MEASUREMENTS OF LARGE MICROWAVE NETWORKS. Weaver, J.; Alvarez, R. (Stanford Linear Accelerator Center, Stanford Univ., Calif.). May 1966. Contract AT(04-3)-400. 23p. (HEPL-442; CONF-660541-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Symposium on Microwave Theory and Techniques, Palo Alto, Calif.

The Stanford two-mile linear accelerator uses 240 single-input-port, four output-port, S-band, rectangular-waveguide networks to feed r-f energy sixty to seventy feet from the klystrons above ground to ten-foot-long, disc-loaded circular-waveguide, accelerator sections below ground. During installation it is necessary to permanently adjust the phase lengths of the four network branches to be within ±4.5 electrical degrees of the design lengths for r-f wave and electron beam synchronization. A modulated reflection phase length comparison method is used, whereby a small signal is sent into each branch and reflected, in turn, by a diode switch, which is turned on and off at a 1kHz rate. A null occurs in the amplitude modulation of the sum of a large reference signal and the small reflected signal when the two signals are nearly in phase quadrature. The reflectors are placed so that the network branches are properly adjusted when the nulls from all branches occur for the same setting of a variable phase shifter in the measurement line. Small mismatches and multiple power divisions do not affect the accuracy of this method. Frequency, temperature and air pressure are the main environmental conditions affecting the measurement and are discussed along with the design of the reflecting diode switch, which is mounted in a vacuum-sealed waveguide flange. (auth)

35966 (SLAC-PUB-193) MAGNETIC FIELD EFFECTS IN HYDROGEN THYRATRONS. Bradford, Robert W. (Stanford Linear Accelerator Center, Stanford Univ., Calif.). May 1966. Contract AT(04-3)-400. 13p. (CONF-660528-4). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 9th Modulator Symposium, Fort Monmouth, N. J.

The use of weak magnetic fields to improve the performance of hydrogen thyratrons (higher peak and average power levels, tighter anode delay-time stability, higher anode hold-off voltages, and faster repetition rates) is discussed. (B.G.D.)

35967 (TID-22971) ANNUAL PROGRESS REPORT, AUGUST 1964-JULY 1965. (Minnesota Univ., Minneapolis. Linear Accelerator and Tandem Van de Graaff Lab.). Sept. 1965. Contracts AT(11-1)-50; AT(11-1)-1265. 195p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

Separate abstracts were prepared for the three sections presented. (B.G.D.)

For abstracts of individual sections see: 35763, 35968, and 36176.

35968 (TID-22971, pp 1-40) ACCELERATOR PROGRESS. (Minnesota Univ., Minneapolis. Linear Accelerator and Tandem Van de Graaff Lab.).

A progress report is presented on the performance of

the proton linear accelerator including improvements to the accelerator leading to better performance and new equipment and techniques which improve the utility of the machine. Activity with the Emperor Tandem Van de Graaff is also reported. (B.G.D.)

35969 (UCD-CNL-49) CENTRAL REGION STUDIES FOR INCORPORATING AN AXIAL ION SOURCE IN THE DAVIS 76-in. CYCLOTRON. Jungerman, J. A.; Kibbe, L. J.; Peek, N. F. (California Univ., Davis. Crocker Nuclear Lab.). May 20, 1966. Contract AT(11-1)-Gen-10. 11p. (CONF-660906-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

For Presentation at International Conference on Nuclear Physics, Gatlinburg, Tenn.

Magnetic field measurements are presented for the cyclotron. The effects of an axial ion source on these measurements are discussed. (M.O.W.)

35970 (UCRL-16554) BEVATRON OPERATION AND DEVELOPMENT. 47. JULY-SEPTEMBER 1965. Crebbin, Kenneth C.; Frias, Robert (Lawrence Radiation Lab., Univ. of California, Berkeley). Mar. 22, 1966. Contract W-7405-eng-48. 19p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The Bevatron provided beam for physics research 84% of the scheduled operating time. The pole-face-winding power supply was modified to provide current regulation and to allow ramping the currents at injection. One primary experiment ended this quarter and four new primary experiments were started. A new system for motor control was installed on the main motor generator sets. The new system provides more versatile control of the motor generators and reduces the input line current variations caused by the pulsed load demand of the Bevatron. (auth)

35971 (UCRL-16741) BEVATRON OPERATION AND DEVELOPMENT. 48. OCTOBER-DECEMBER 1965. Crebbin, Kenneth C. (Lawrence Radiation Lab., Univ. of California, Berkeley). May 5, 1966. Contract W-7405-eng-48. 17p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The beam was on for experimenters 87% of the scheduled operating time. Machine operation for five simultaneous experiments is discussed. A rubber gasket located near the external beam port was replaced; the gasket was damaged by radiation. (auth)

35972 (UCRL-16792) BEAM DIAGNOSTICS AND INSTRUMENTATION. Clark, D. J. (Lawrence Radiation Lab., Univ. of California, Berkeley). May 1966. Contract W-7405-eng-48. 34p. (CONF-660510-17). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From International Conference on Isochronous Cyclotrons, Gatlinburg, Tenn.

Methods of cyclotron beam development and diagnostics are described. Techniques for measuring the space, time, and energy distributions of both internal and external beams are included. Emphasis is on the more recent methods commonly used at many laboratories. (auth)

35973 (UCRL-16793) REGENERATIVE BEAM EXTRACTION. Kim, Hogil (Lawrence Radiation Lab., Univ. of California, Berkeley). Apr. 1966. Contract W-7405-eng-48. 11p. (CONF-660510-14). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Isochronous Cyclotrons, Gatlinburg, Tenn.

A review of regenerative beam extraction for synchrocyclotrons and isochronous cyclotrons is presented. The linear and nonlinear theories of the system for synchrocyclotrons are briefly reviewed. The problems for the extraction efficiency and external beam quality are discussed. A theory for isochronous cyclotrons is given. Finally, present operating features of the systems and future prospects are summarized. (auth)

35974 (UJV-1408/66) THE EFFECT OF D. C. DEE VOLTAGE IN A CYCLOTRON ON INITIAL ION TRAJECTORIES. Hrda, A.; Kult, K.; Kuzmiak, M. (Ustav Jaderneho Vyzkumu, Ceskoslovenska Akademie Ved, Rez). Feb. 1966. 10p. Dep. mn.

The presence of a d-c electric field between the cyclotron dees at the same time with the h-f field causes a shift of the stationary orbits parallel to the dee edge. Owing to this shift the ion energy of the external beam may be decreased. It is shown that the shape change of the initial ion trajectory in a cyclotron is due to the d-c dee bias. (auth)

35975 DEVICE TO TRIGGER A 150-kv COCKCROFT-WALTON ACCELERATOR. Pajares, J. A. (Junta de Energia Nuclear, Madrid). An. Real Soc. Espan. Fis. Quim. (Madrid), Ser. A, 62: 129-35(May-June 1966). (In Spanish).

A device to trigger a 150 kv Cockcroft-Walton accelerator used as a pulsed neutron source is described. A DM160 special quality, long-life voltage indicator tube, generally used in transistorized digital computers, is utilized as a light pulse generator. Schematic circuit diagrams are given. (auth)

35976 PARTICLE ACCELERATOR. Iwashita, Fumio (to Tokyo Shibaura Electric Co., Ltd.). Japanese Patent 1965-14359. July 8, 1965. Filed Oct. 5, 1963.

An improved particle accelerator is proposed for producing electrons and x rays intermittently under a predetermined program for use in radiotherapy. The accelerator includes accelerating electromagnets, an accelerating tube, a device installed at the electromagnets to detect the change of the magnetic flux of the accelerating magnetic field, a device to retard the output of the detector according to the predetermined program, and a device to supply the output of the retarding device to the accelerating tube as the input voltage. The phase of the input into the accelerating tube is changed as required; thereby achieving the intermittent irradiation and the programmed irradiation control. (NSA of Japan)

35977 CHARGED PARTICLE ACCELERATOR. Komai, Kenichiro (to Hitachi Ltd.). Japanese Patent 1965-14240. July 7, 1965. Filed Oct. 25, 1963.

A charged-particle accelerator is proposed in which the high-frequency power, remaining in the accelerating tube after the termination of accelerating high-frequency input pulses, is utilized to further accelerate the charged particles thereby increasing the accelerator average output. The accelerator has one or more accelerating tubes, in which the charged particles from their source are accelerated by means of the high-frequency radio waves supplied from their source. The pulse width of the charged particles, injected into one accelerating tube at least, is made larger than the pulse width of the high-frequency radio waves supplied to the same accelerating tube. (NSA of Japan)

35978 NUCLEAR REACTION TARGET FOR A PARTICLE ACCELERATOR. Iwashita, Fumio (to Tokyo Shibaura Electric Co., Ltd.). Japanese Patent 1965-7960. Apr. 22, 1965. Filed Sept. 12, 1963.

A nuclear-reaction target for use with a particle accelerator has a base that is concave, convex, or a combination of the two; and an activation material is attached to this base. With this target the rise in temperature at the time of irradiation is prevented to a large extent, and the beam input per unit area onto a target can be reduced without making the cross section of the accelerated particle beam very large. (TCO)

35979 ACCELERATING TUBE. Iwashita, Fumio (to Tokyo Shibaura Electric Co., Ltd.). Japanese Patent 1965-7760. Apr. 20, 1965. Filed Sept. 11, 1962.

An accelerating tube is constructed by alternately arranging copper disks with a hole in the center and copper rings to act as the hollow resonators. The outside of these members is thickly plated with a metal, e.g., Cu, bonding them together to form the accelerating tube. (TCO)

35980 PARTICLE ACCELERATOR. Seto, Shoji (to Tokyo Shibaura Electric Co., Ltd.). Japanese Patent 1965-7440. Apr. 14, 1965. Filed Sept. 30, 1963.

A particle accelerator is described that consists of a pressure tank containing an ion source and accelerating

tube, a radiation detector installed on the outside of the tank in opposition to the ion source, a count rate meter connected to the detector, a control device connected to the meter, and a pressure control valve actuated by the control. When the radiation dose rate exceeds a predetermined value, a gas is automatically injected into the accelerating tube to prevent electron-loading. (TCO)

35981 HIGH DENSITY, HIGH YIELD ION SOURCE. Henning, P.; Fasolo, J. A.; Hilton, J. L.; Luce, J. S. 11p. (CONF-650927-13). ORAU. Gmelin, AED-CONF-65-222-6.

From American Physical Society Meeting, Honolulu, Hawaii.

An ion source is described which was developed as part of a 600-kv 250 mamp accelerator. The accelerator will serve as the injection system for a magnetic plasma containment device. The design and performance of this ion source are discussed. (J.F.P.)

Astrophysics and Cosmology

Refer also to abstracts 36013 and 36095.

35982 (AD-635162) AN ELECTROSTATIC ANALYZER TO MEASURE AURORAL ELECTRON ENERGY AND ANGULAR DISTRIBUTIONS. Final Report, June 21-October 20, 1965. Reidy, W. P.; Hegblom, E. R. (American Science and Engineering, Inc., Cambridge, Mass.). Mar. 28, 1966. Contract AF19(628)-5512. 66p. (ASE-1211; AFCRL-66-275). CFSTI $3.00 cy, $0.75 mn.

An electrostatic analyzer designed to measure the energy spectrum and pitch angle distribution of electrons between 2 and 50 kev in the upper atmosphere during an aurora is described. The details of the instrument's design, operation, and calibration are presented. The flights of two electrostatic analyzers on two Nike Iroquois rockets launched from Fairbanks, Alaska, in October 1965 are described; and a preliminary analysis of the data for one sweep over the energy range from 2 to 20 kev is presented. (auth)

35983 (N-66-17619) ANALYSIS OF POTENTIAL SECONDARY EXPERIMENTS FOR A SOLAR-THERMIONIC FLIGHT TEST VEHICLE. VOLUME II. SCIENCE EXPERIMENTS CATALOG. Final Report. (Electro-Optical Systems, Inc., Pasadena, Calif.). Nov. 19, 1965. Contracts NAS7-100; JPL-951162. 220p. (NASA-CR-70097; EOS-6961-Final). CFSTI $6.00 cy, $1.25 mn.

For Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

Approximately 100 science experiments were reviewed for their applicability as potential secondary experiments in a solar-thermionic test vehicle. Selected science experiments had to be new or provide more detailed measurements of scientific areas. Due to the sun orientation of the spacecraft and the types of orbits specified, science experiments were more numerous in the solar physics and particle and fields disciplines. Descriptions of selected experiments in the fields of astronomy, solar physics, particle and fields, planetary atmospheres, ionospheres and radio physics, and planetology are presented in detail. Bioscience experiments were eliminated because they required environmental control and data handling beyond the capability of the vehicle. (STAR)

35984 (N-66-18361) PRESUPERNOVA EVOLUTION (NEUTRINO STARS). Chiu, Hong-yee (National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies). [1965]. 27p. (NASA-TM-X-56171). CFSTI $2.00 cy, $0.50 mn.

The later stages of stellar evolution, when the internal temperature is above 10^{9}°K, are affected by neutrino processes. Under these conditions the neutrino emission occurs at a rate higher than the photon emission rate. It is found that the homology relation breaks down completely and that in general the density rises much faster than the third power of temperature. In regions where nuclear burning commences the interior stellar structure is determined by the condition: (nuclear energy production rate) + (neutrino energy dissipation rate) = 0. Such curves have negative power dependence on temperature or are isothermal depending on the density. The rapid removal of energy from the core of the star results in a short-time scale for these stages and the star continues to contract. The stars evolve to a very high central density at a rather low central temperature. Stellar collapse will be induced at this density and temperature either by β-transition or by a small amount of iron-helium transition. (auth)

35985 (NASA-SP-7026) PARTICLES AND FIELDS RESEARCH, A Bibliography with Author Index. Hess, Wilmot N.; Mead, Gilbert D. (comps.) (National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center). 1966. 161p. CFSTI $2.50 cy, $1.25 mn.

A bibliography of published articles on particles and fields research from 1958 to May 1, 1966, is presented. The bibliography includes research on; solar wind, comets, interplanetary medium; interaction of solar wind with earth, moon, and planets; Van Allen radiation belts; auroras; cosmic radiation; geomagnetism and the magnetosphere; geomagnetic tail; and neutrons. (B.G.D.)

35986 (UCSD-34P43-5) ORIGIN OF THE MOON. Urey, H. C. (California Univ., La Jolla, San Diego). June 1966. Contract AT(11-1)-34. 20p. (CONF-660331-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Mantles of the Earth and Terrestrial Planets Meeting, Newcastle-upon-Tyne, Eng.

A review is presented of various hypotheses on the origin of the moon. (M.O.W.)

35987 GEOCHEMICAL AND COSMOCHEMICAL APPLICATIONS. Bowen, H. J. M. (United Kingdom Atomic Energy Authority, Wantage, Eng.). pp 107-11 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Advances in cosmochemistry through activation analysis of meteorites and micrometeorites are reviewed. Discussions of geochemical, hydrogeochemical, and chronogeochemical problems are included. (P.C.S.)

35988 ASYMMETRICAL STOP ZONES IN JUPITER'S EXOSPHERE. Gulkis, Samuel; Carr, Thomas D. (Univ. of Florida, Gainesville). Nature, 210: 1104-5(June 11, 1966).

The magnetic field of Jupiter initially guides the radiation reaching earth. The asymmetry in the emission probability as a function of central meridian longitude is assumed to be due to asymmetrical beaming of the radiation. The beaming asymmetry is assumed to be caused by field distortion. It was found that another effect of field distortion is to produce a variation with longitude in the thickness of the stop zone for frequencies in the vicinity of the gyrofrequency. (D.H.M.)

35989 PROBABLE VALUE OF THE TIME OF RISE FOR THE SUNSPOT CYCLE NO. 20. Xanthakis, John (Research and Computing Center, Academy of Athens). Nature, 210: 1242-3(June 18, 1966).

Variation of the values of the time of rise T_R from cycle to cycle of solar activity was studied by considering, separately, cycles with the same polarity in sunspot magnetic fields. Cycles with different polarity show different time of rise as well as time of interval between the successive maxima. On the basis of these periodicities it is not possible to determine the value of T_R that corresponds to the current cycle No. 20, because the amplitude of variation changes from one 8- or 10-cycle period to the other. No positive values are given. (P.C.S.)

35990 PULSED-NEUTRON MEASUREMENTS IN DIPHENYL AT 24, 85, AND 105 DEG C. Reier, M. Nucl. Sci. Eng., 25: 390-4(1966).

The diffusion parameters of diphenyl at 24, 85, and 105°C were investigated using a pulsed-neutron source. Particular emphasis was placed on reducing the effect of room-return background, a major source of error in experiments of

this type. The data were analyzed by the usual three-parameter fit and in terms of the thermalization time constant. The results are in good agreement with a theoretical calculation and measurements using differential techniques but do not show a discontinuity of D_0 vs T in going from the solid to the liquid phase. (auth)

35991 HYDROMAGNETIC WAVES IN THE INTERPLANETARY PLASMA. Coleman, Paul J. Jr. (Univ. of California, Los Angeles). Phys. Rev. Lett., 17: 207-11(July 25, 1966).

A preliminary report is presented concerning a comparison of simultaneous measurements of the plasma velocity and the magnetic field in interplanetary space. The measurements were obtained with the positive-ion spectrometer, incorporating a cylindrical electrostatic analyzer, and the fluxgate magnetometer on board the spacecraft Mariner-II, while the spacecraft was in transit between the earth and Venus. The properties of the simultaneous variations in the magnetic field and the plasma velocity are described. It is shown that these properties are among those expected if the variations were produced by hydromagnetic waves. (M.H.R.)

35992 HIGH ENERGY PHOTONS FROM THE COMPTON-SYNCHROTRON PROCESS IN THE CRAB NEBULA. Gould, Robert J. (Univ. of California, La Jolla, San Diego). 9p. (CONF-650927-12). ORAU. Gmelin, AED-CONF-65-222-8.

From American Physical Society Meeting, Honolulu, Hawaii.

The Compton synchrotron spectrum of the Crab nebula was computed on the assumption that there exists therein production of a synchrotron spectrum extending from the radio to x-ray region. The results of these calculations are shown in which the spectral energy flux is plotted against frequency. The observed assumed synchrotron spectrum and the calculated total Compton synchrotron spectrum are given. (J.F.P.)

Atomic Physics

35993 (AECL-2567) RADIATION INDUCED ELECTRON EMISSION. Bayly, J. G.; Chidley, B. G. (Atomic Energy of Canada Ltd., Chalk River (Ontario)). Apr. 1966. 21p. Dep. mn. AECL $0.50.

Electron emission due to gamma irradiation is examined experimentally, and an empirical expression given for the net current between parallel electrodes as a function of the intensity of irradiation and of the applied voltage. The emission from aluminum is one electron/cm^2 for an energy deposition rate of 140 ev/microgram. By extrapolation to the conditions in a power reactor, an estimate of a possible effect of irradiation on corrosion rate can be made. (auth)

35994 (CEA-R-2921) NOUVELLES MESURES DANS LE SPECTRE D'EMISSION L DU PLUTONIUM AU MOYEN D'UN MICRO ANALYSEUR A SONDE ELECTRONIQUE. (New Measurements in Plutonium L X-Ray-Emission Spectrum Using an Electron Probe Microanalyzer). Bobin, Jean-Louis; Despres, Jean (Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires). Apr. 1966. 30p. Dep. mn.

A plutonium x-ray spectrum table was established from studies with an electron-probe micro-analyzer. Measurements on plutonium L_{II} and L_{III} levels excitation potentials were achieved. Remarks on apparatus performance data (spectrograph sensitivity, resolving power and accuracy) is included in the appendix. (auth)

35995 (IA-1037) DIFFERENTIATION BETWEEN ErI AND ErII SPECTRA USING ONLY A DC ARC AS EXCITATION SOURCE. Held, Sima (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). Jan. 1966. 164p. Dep. mn.

Differentiation between the neutral atom and ion spectra of Er in the 2260-6900A spectral range was achieved using only a d-c arc as excitation source. The wavelengths were taken from Gatterer and Junkes in the spectral range 2262.50-2670.26 Å and from Marquet in the spectral range 2670.26-6897.43 Å. In the present work, in addition to the 1500 lines already classified as ErI or ErII, about 3000 lines from the Marquet list of Er lines are assigned to the first or second spectrum. The spectrum assignments given in the present work for lines already classified are compared with the published data. Discrepancies were observed for about 60 lines. About 700 ErI lines in the spectral region above 3600 Å are assumed to originate from high energy levels, according to their behavior in d-c arc and electrodeless discharge. It was found that about 300 of the lines included in Marquet's list of Er lines probably do not belong to erbium but to the impurities Zr, Ti, Tm and Fe. Approximately half the lines listed by Marquet were not detected on the spectrograms obtained under the experimental conditions of the present work. (auth)

35996 (JINR-P-2735) IZMERENIE ENERGII (2P-1S)-PEREKHODOV MYUONOV V ATOMAKH OT SERY DO KHROMA. (Measurement of the Energy of (2P-1S) Transitions in Muonic Atoms of Elements From Sulfur to Chromium). Budyashov, Yu. G.; Zinov, V. G.; Konin, A. D.; Mukhin, A. I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1966. 11p. Dep. mn.

The energies of /2P-1S/ transitions in muonic atoms of S, Cl, Ar, K, Ca, Cr are measured with an accuracy of 0.3% using a NaI spectrometer. The obtained results agree well with the theoretical calculations. (auth)

35997 (N-66-18395) EXCITATION OF ATOMIC HYDROGEN BY PROTONS. Cheshire, Ian M.; Sullivan, Edward C. (National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center). Nov. 1965. 11p. (NASA-TM-X-55401; X-641-65-474). CFSTI $1.00 cy, $0.50 mn.

Excitation cross sections (S-state) for proton-hydrogen atom collisions are calculated by a nonadiabatic method. Consideration is given to reactions of the type, p + H(is) → p + H(ns). (STAR)

35998 (ORO-2911-7) THE INTERACTION OF HEAVY kev IONS WITH GASES. Progress Report, June 1, 1965-May 31, 1966. Boring, John W. (Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences). June 1966. Contract AT(40-1)-2911. 20p. (EE-3930-103-66U). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A theoretical investigation was made to improve the calculations of energy ultimately given to the atom of the stopping gas by using a Thomas-Fermi model for obtaining elastic scattering cross sections and for using a simple model for calculating the number of electrons ejected in an inelastic collision and a corresponding value of the average energy required to produce an ion pair. Calculations are given for several ion collisions with argon and nitrogen gases. (M.O.W.)

35999 (SGAE-PH-40/1966) MULTIPLE ELECTRON SCATTERING IN THIN FOILS. Paul, H.; Tatzber, W. (Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf). [1966]. 32p. Dep. mn.

A Monte Carlo program was used to calculate angular distributions of electrons backscattered from or transmitted through thin foils, neglecting energy loss. The single scattering cross sections were taken from the review article by Motz et al. Electron sources were assumed monodirectional or isotropic. The following electron energies (foil materials) were considered: 50, 100, 200 kev (Al) and 100 kev (N and Ag). For a monodirectional source and normal incidence, the angular distribution of transmitted electrons is found to agree with Molière's theory, and an attempt is made to compare the backscattering coefficient to measured transmission values. For oblique incidence, electrons appear to be reflected at the surface, and the distributions are similar to those measured by Kanter. (auth)

36000 (TID-23132) CESIUM ION SPUTTERING OF MONOCRYSTALLINE ALUMINUM. Andrews, Andrew Edward (California Univ., Berkeley). [1965]. Con-

tracts AT(11-1)-34; NAS3-5743. 19p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Thesis.

A neutron activation technique was developed to investigate cesium–aluminum sputtering. Measurements were made under clean surface conditions in which the flux of oxygen molecules striking the target surface from the vacuum chamber was an order of magnitude less than the flux of aluminum atoms sputtered from the surface. Reproducible results, using a (110) single crystal of aluminum mounted normal to the ion beam, have been obtained for the sputtering yield at ion energies from 1 to 10 kev. The results show an increase in yield from 0.74 to 2.4 atoms per ion for this energy range. (auth)

36001 INTERACTION OF ELECTRONS AND α-PARTICLES WITH MATTER. Knop, G.; Paul, W. pp 1-36 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Seigbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

The elastic scattering of electrons by atomic nuclei is treated according to four classes; single scattering; plural scattering; multiple scattering; and diffusion. The discussion is restricted to electron energies in the range 10^4 to 10^7 ev. Energy losses due to inelastic collisions, bremsstrahlung, and ionization are discussed, and the determination of range and energy relations by absorption measurements is treated. The electromagnetic interaction of alpha particles with matter is also treated for energies of about 10 Mev. The possibility of capture and loss of electrons at very low velocities is discussed. 83 references. (L.B.S.)

36002 TABLES OF ELECTRON BINDING ENERGIES AND KINETIC ENERGY VERSUS MAGNETIC RIDIGITY. Hagstroem, S.; Nordling, C.; Siegbahn, K. pp 845-62 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

Electron binding energies based on electron spectroscopic data are tabulated. Kinetic energies of conversion electrons are also tabulated. 25 references. (L.B.S.)

36003 TABLE OF ELECTRON BINDING ENERGIES. Hagstroem, S.; Nordling, C.; Siegbahn, K. (Uppsala Univ.). pp 644-53 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A table of electron binding energies based on electron spectroscopic data is presented. Results obtained using this method strongly indicate that it yields more accurate results for binding energies than the previously used x-ray absorption method. (J.F.P.)

36004 BEAM CONTROLLABLE PIG ION SOURCE. Cheon, Beonguk; Akimune, Hideo; Suita, Tokuo (Osaka Univ.). Jap. J. Appl. Phys., 5: 628-34(July 1966).

A modified hot cathode-PIG source was designed to deliver molecular hydrogen ions, H_2^+, in a high ratio to the number of H_3^+ ions, and to have a sharp ion beam cutoff. The source has a canal electrode in a cylindrical shape under the PIG cell. The extracted ion current is controlled by the canal potential. The minimum fall time of the beam is 0.1 μsec which shows the feasibility of a pulse beam with a smaller duration than 1 μsec. Mass analysis of the source output shows that the H_2^+ component can be over 80% and this high ratio is due to the suppression of H_3^+ formation. Although this result is obtained only by variation of the canal potential, it shows that Verney's assertions are realized. (auth)

36005 STUDY OF SOME ASPECTS OF IONIZATION IN RAREFIED GAS. Momigny, J. Mem. Soc. Roy. Sci. Liege, 13: No. 1, 1-248(1966). (In French).

The problems of the interactions of the electrons or protons with energies between several volts and several tens of electron volts with gases at pressures such that the collisions between their molecules are practically nonexistent are studied. The following points are considered in succession: some problems raised by the interpretation of phenomena accompanying the appearance of positive molecular ions both under electron and proton impact: ionization phenomena in two stages, generally called phenomena of preionization or of self-ionization; the problem of the a priori calculation of the total cross sections for the appearance of diatomic molecular ions and of the a priori calculation of the effect of the temperature of the gas on the cross section (the interpretation of the results of an experimental study relative to this effect is made in the light of results from theoretical calculations); the problem of the appearance of fragmentary ions and the interpretation of the existence and behavior of metastable fragmentary or molecular ions; a systematic study of ionization phenomena in certain types of molecules with the purpose of establishing a complete or partial energy scheme of the molecular decompositions following their ionization; a critical review of previously proposed hypotheses for the interpretation and prediction of ionization phenomena in rarefied gaseous phase. (J.S.R.)

36006 A NOTE ON DERIVATION OF SCATTERING AMPLITUDE FOR ELECTRON SCATTERING ON ATOMS ACCORDING TO GLAUBER AND SCHOMAKER. Dreizler, H. (Univ., Freiburg i. B.). Z. Naturforsch., 21a: 475 (Apr. 1966). (In German).

Glauber and Schomaker (Phys. Rev., 89: 667(1953)) show that in molecules formed from atoms with different nuclear charge numbers it is necessary to work with complex scattering amplitudes. A proof of an equation relating the amplitude and complex amplitude using wave vectors that do not necessarily lie in one plane is presented. (J.S.R.)

36007 CHARGE TRANSFER IN COLLISIONS OF SLOW H^- IONS WITH O_2. Fischer, R.; Neuert, H.; Peuckert-Kraus, Karen; Vogt, D. (Institut fuer Experimentalphysik, Hamburg). Z. Naturforsch., 21a: 501-2(Apr. 1966). (In German).

H^- ions were formed from H_2O or NH_3 by electron collisions. The flux of H^- ions was measured during variation of the electron energy in small steps, and the formation of O_2^- ions was simultaneously recorded. The results obtained are graphed. The results showed that the electron affinity of O_2 is larger than that of H. The value given by Pritchard of 0.9 ev for the charge transfer is reliable. (J.S.R.)

36008 THE ELECTRON g_J-FACTOR OF ^{23}Na. Aygun, Erol; Ehlers, Vernon J.; Saplakoglu, Adnan; Shugart, Howard A. 4p. (CONF-650927-10). ORAU. Gmelin, AED-CONF-65-222-17.

From American Physical Society Meeting, Honolulu, Hawaii.

The electronic g_J factor was measured for various metals. The results obtained for ^{23}Na compared to the ^{39}K resonance frequency in which the g_J of ^{23}Na is plotted assuming a particular g_J for ^{39}K are shown, Also the g_J factors for potassium, rubidium, cesium, gold, and copper were found and are given. (J.F.P.)

Cosmic Radiation

See also Elementary Particles and Radiations
Nuclear Properties and Reactions

Refer also to abstract 35985.

36009 DEGREE OF POLARIZATION OF μ-MESONS OF COSMIC RAYS AT 3860 m. ABOVE SEA LEVEL. Bobodzhanov, I. B.; Kashkarov, L. L. Dokl. Akad. Nauk Tadzh. SSR, 7: No. 10, 12-15(1964). (In Russian).

The degree of polarization of mesons (μ^-) at energies $E \geq 2$ Bev in cosmic radiation is evaluated by considering the angular distributions of neutrons from (μ,n) reactions and of electrons from the $\mu^- \rightarrow e$ decay. This degree of polarization at 3860 m above sea level is found to be 80%. (J.F.P.)

36010 COSMIC RAY NEUTRON INTENSITY MONITOR. SECTION 2.1. Simpson, John A. (Univ. of Chicago). Geophys. Space Data Bull., 2: No. 4, 15-22(1965).

The cosmic neutron monitor hourly counting rate corrected for pressure variations is presented for Chicago, Illinois, and Climax, Colorado, U.S.A. from October to December, 1965. The geographic latitude, longitude, mean station pressure, barometric coefficient, altitude, and scale factor are given. (J.F.P.)

36011 COSMIC RAY NEUTRON INTENSITY MONITOR. SECTION 2.2. Lockwood, John A. (Univ. of New Hampshire, Durham). Geophys. Space Data Bull., 2: No. 4, 23-74(1965).

The cosmic neutron hourly counting rate is presented for Durham, New Hampshire, for July 1, 1964, to December, 1965. Also corrected data are presented from October to December, 1965. The mean station pressure, scaling factor, and barometric coefficient is given. (J.F.P.)

36012 SOME RESULTS FROM THE IMP-1 G-M COSMIC-RAY DETECTOR. Balasubrahmanyan, V. K. (Goddard Space Flight Center, Greenbelt, Md.); Ludwig, G. H.; McDonald, F. B.; Palmeira, R. A. R. Notas Fis., Centro Brasil. Pesquisas Fis., 11: 217-33(1964).

Results obtained with two mutually perpendicular G-M telescopes on board the IMP-1 (Explorer XVIII) satellite are presented. It is shown that these results imply an anisotropic recovery of the cosmic ray intensity towards the maximum of the 11-year variation, the greatest modulation taking place in a direction close to the ecliptic poles. It is also shown that these results are consistent with the current views concerning the cavity that the solar wind produces in the inner solar system when it is slowed down and stopped by the galactic material. The omnidirectional intensity of particles with energy >40 Mev seems to suffer periodic fluctuations with period close to 12 hours. It is further shown that these fluctuations agree in amplitude and phase with similar fluctuations measured with the Deep River Super Neutron Monitor (the semidiurnal variation). This suggests the existence of a mechanism capable of producing a true time variation in the cosmic ray intensity as seen by the satellite detector, and this mechanism could also explain the semidiurnal variation measured with ground detectors. No explanation is offered for such a mechanism. (auth)

36013 LOW-ENERGY COSMIC-RAY MODULATION RELATED TO OBSERVED INTERPLANETARY MAGNETIC FIELD IRREGULARITIES. Gloeckler, G.; Jokipii, J. R. (Univ. of Chicago). Phys. Rev. Lett., 17: 203-7 (July 25, 1966).

The diffusion coefficient describing the motion of cosmic particles in the interplanetary magnetic field is determined from the power spectrum of magnetic irregularities observed on space probes, and is found to be proportional to $R\beta$ (R = particle magnetic rigidity, β = particle velocity). Near minimum solar activity, only this dependence of the diffusion coefficient on R and β can account for the observed long-term intensity variations of cosmic-ray protons and helium nuclei down to 10 Mev per nucleon in energy. Thus, the motion of cosmic rays in interplanetary space may be quantitatively related to the observed magnetic field. (auth)

Direct Energy Conversion

Refer also to abstracts 35824–35826, 36338, and 36339.

36014 (AD-621726) DIRECT ENERGY CONVERSION IN THE USSR: THERMIONIC CONVERTERS. (Aerospace Technology Div., Library of Congress, Washington, D. C.). Sept. 22, 1965. 154p. (N-65-36572; ATD-P-65-57). CFSTI $5.00 cy, $1.00 mn.

A survey of Soviet scientific and technical literature is presented on the physical foundations of thermionic energy conversion and general operational properties of thermionic converters. Discussions are included on thermoelectron emission, volt-ampere characteristic and difference of contact potential, positive surface ionization and evaporation heats, space charge and its neutralization, transport phenomena, qualitative theory of plasma thermoelements, classification schemes of thermionic energy conversion modes, vacuum with current limited by space, vacuum with space charge compensated, rectilinear path mode. Ioffe's concept of a plasma thermocouple, simple diffusion mode, phenomena at increased plasma pressures, discharge mode, and arc mode. (STAR)

36015 (N-66-18407) DEVELOPMENT OF AN IMPROVED RADIATION-RESISTANT SOLAR CELL. Final Report. German, P.; Kiba, W. (Heliotek, Sylmar, Calif.). Jan. 10, 1965. Contract NAS5-3558. 122p. (NASA-CR-70587). CFSTI $4.00 cy, $1.00 mn.

A new cell design utilizing a drift field in the base region was developed. The first consideration given to this cell design was a theoretical analysis of various drift field cell configurations and of their performance after various radiation dosages to determine what improvements, if any, could be obtained through utilization of a drift field in the base region of a solar cell. It was found, on the basis of an extensive theoretical study by Wolf, that indeed significant improvement could be obtained through utilization of a drift field with optimized width and field strength for a particular radiation environment. A new approach for fabricating drift field cells was conceived using an epitaxial technique, and preliminary experimentation to prove feasibility was performed. The objective was to further develop the state-of-the-art of this cell. The first phase was devoted to the improvement of the methods and techniques used in the fabrication of the drift field solar cell. (auth)

36016 (RISO-M-399) ELEKTRICITET DIREKTE FRA ATOMENERGIEN. (Electricity Directly From Atomic Energy). Pedersen, Erik Storm (Danish Atomic Energy Commission, Risoe. Research Establishment). May 10, 1966. 36p. Dep. mn.

The production of electricity directly from atomic energy without the use of pumps or turbines is described. This is possible by the use of magnetohydrodynamic thermoelectric, and thermionic devices used in conjunction with a nuclear reactor or radioisotopes as heat sources. The principles of these three direct conversion methods are explained, and some of the problems to be solved before they become important as power sources are discussed. Present and future systems are described. (auth)

36017 PROBLEM OF FINITE BREADTH OF INDUCTIVE MULTIPHASE MHD CONVERTERS. Weh, H. (Technische Hochschule, Brunswick). Advance. Energy Convers., 6: 77-88(Apr.-June 1966). (In German).

The influence of the finite breadth on the performance of rectangular MHD-converters is investigated. It is shown that in the case of an isotropic fluid the electric current extends in two dimensions, and that there exist no currents in y-direction. As expected an increasing resistance of the lateral conductor will enlarge the losses at constant power of the MHD converter. The maximum output of a sodium converter with copper lateral conductor will scarcely be diminished, compared with the limiting case of an infinitely broad converter if, according to conditions of this calculation, the magnetic field coupled with the lateral conductor may be neglected and the ratio b/τ is not too little. If one diminishes the conductivity of the lateral conductor by choice of appropriate materials or by decreasing the cross section, there will be decreased the maximum output and the losses. The deformation of the current location-curve may be explained by a decoupling between primary and secondary part, increasing with enlarged x-component of the electrical currents. The influence of the ratio b/τ is strongest at $\rho_s = \infty$. As the calculations show, in the case of narrow converters ($b/\tau < 1$) the lateral conductor should have a particularly high conductivity to avoid additional losses of the lateral conductors. Taking into consideration these points of view, it seems possible to construct inductive multiphase converters with copper as lateral conductor material, in

which the additional losses, caused by the two dimensional current distribution in the conductive fluid, are limited to tolerable amount. (auth)

36018 EGD-HARNESSED ELECTRIC WIND. Gourdine, Meredith C. Ind. Res., 8: No. 8, 71-6(July 1966).

The development of electrogasdynamic generators is considered. The physics of these generators and their performance are discussed. Among the applications described are electric power, energy storage devices, EGD precipitator, air pollution control, and very high voltage vacuum tubes. Other applications also mentioned are high-energy particle accelerators, electron beam welding, water desalination, gas compression, and jet engines. (J.F.P.)

36019 AN ISOTOPE-POWERED MERCURY RANKINE POWER SYSTEM FOR MANNED APPLICATIONS. Rudy, James A.; Lenhart, Jack G. (TRW Inc., Cleveland). 23p. (CONF-651110-28). ORAU. Gmelin, AED-CONF-65-327-5.

From American Society of Mechanical Engineers, Annual Winter Meeting, Chicago.

A recent study optimizing a mercury Rankine power conversion system for a manned, deep space mission is summarized. Basic considerations of developed technology and hardware designs are related to requirements for the manned isotope powered application, and an optimized design is defined. In designing for an isotope energy source, rather than a reactor source, conversion efficiency can be nearly doubled within technology developed on the SNAP 1, SNAP 2, and Sunflower programs. (auth)

36020 SURVEY OF THERMIONIC CONVERSION FOR SPACE POWER. Houston, John M. 16p. (CONF-651133-1). ORAU. Gmelin, AED-CONF-65-404-1.

From Northeast Electronic Research Engineering Meeting, Newton, Mass.

Present-day performance of laboratory-type cesium-diode heat-to-electricity converters is reviewed. Potential space power applications are discussed, including the use of solar, isotope, and reactor heat sources. (auth)

Elementary Particles and Radiations

See also Field Theory, Scattering Theory, and Symmetries

36021 (AD-635846) RADIATIVE DECAY OF THE MUON. Bogart, Elliot (Nevis Labs., Columbia Univ., Irvington-on-Hudson, N. Y.). May 1966. Contract Nonr-266(72). 84p. (NEVIS-151; R-551; CU-255). CFSTI $3.00 cy, $0.75 mn.

Thesis.

The radiative decay of the muon, $\mu^+ \rightarrow e^+ + \nu + \nu_e + \bar{\nu}_\mu$, was measured using muons from the Columbia University Nevis Synchrocyclotron. The decay products e^+ and γ were observed at relative angles near 180°, using scintillation counters and two 9 in. × 10 in. NaI crystals, which enabled simultaneous measurement of the positron and gamma energies. The pulses from the crystals were displayed on oscilloscopes and photographed, and the measured amplitudes of these pulses were calibrated using the positron spectrum of the nonradiative decay. The two-dimensional energy spectrum for positrons and gammas was obtained for about 900 events, after subtraction of background. This spectrum and the measured rate, obtained by normalizing to the nonradiative decay, were compared with theoretical predictions for the radiative decay. The results were in good agreement with the theory, within statistics, for the case of pure V-A coupling. (auth)

36022 (BNL-945) SOME MORE TWO-BODY KINEMATICS TABLES. Leipuner, L. B. (Brookhaven National Lab., Upton, N. Y.). Oct. 1965. Contract AT-30-2-GEN-16. 719p. Dep. mn. CFSTI $10.10 cy, $3.00 mn.

An updated version of BNL 513 (T-125) is presented. Kinematic tables are presented for antiproton and meson interactions with protons and decays of mesons and hyperons. (B.G.D.)

36023 (CALT-68-70) $p\bar{p}$ ANNIHILATION IN FLIGHT TO MESON AND ELECTRON PAIRS. Barish, B.; Fong, D.; Gomez, R.; Hartill, D.; Pine, J.; Tollestrup, A. V. (California Inst. of Tech., Pasadena); Maschke, A. (Brookhaven National Lab., Upton, N. Y.); Zipf, T. (Stanford Linear Accelerator Center, Stanford Univ., Calif.). Apr. 22, 1966. Contract AT(11-1)-68. 16p. (CONF-660425-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Conference on Two Particle Interactions, New York.

Cross sections for the reactions $p + \bar{p} \rightarrow e^+ + e^-$ and $\bar{p} + p \rightarrow \pi^+ + \pi^-$ are measured at 1.5 to 2.5 Bev/c and 1.0 to 1.75 Bev/c, respectively. (B.G.D.)

36024 (COO-1428-16) ANNUAL PROGRESS REPORT [ON HIGH-ENERGY PHYSICS], JUNE 1, 1965-MAY 31, 1966. (Purdue Univ., Lafayette, Ind.). Contract AT(11-1)-1428. 26p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The experimental physics research during this period consisted of analysis of 2.7-Bev/c π^- p 4-pronged events, 2.7 Bev/c π^- p 2-pronged events, 4.2-Bev/c π^- p 2-pronged events, and 5.0-Bev/c π^- p strange particles. The recoil proton polarization in π^+ p elastic scattering is also briefly discussed. The data analysis program deals with: on-line measuring and reconstruction programming, SMP optical calibrations, SMP diagnostics, and 7044 systems programming. Further programming developments are reported. (M.O.W.)

36025 (DESY-66/9) EINFLUSS VON ABSORPTION-SKORREKTUREN AUF PERIPHERE PHOTOERZEUGUNG-SPROZESSE. (Influence of Absorption Corrections on Peripheral Photoproduction Processes). Schilling, K. (Deutsches Elektronen-Synchrotron, Hamburg (West Germany)). Apr. 1966. 64p. Dep. mn.

Photoproduction of pions and vector mesons and the joint photoproduction of vector mesons and the first π-N resonance on nucleons are considered in the peripheral model. Absorptive final-state interactions are taken into account. The differential cross section and the spin state density matrices of the resonances are calculated and compared with experimental data. (auth)

36026 (DESY-66/15) COHERENT BREMSSTRAHLUNG AND PAIR PRODUCTION IN THE DIAMOND CRYSTAL IN GRAPHICAL REPRESENTATION BETWEEN 1 AND 40 Gev. Lutz, G.; Timm, U. (Deutsches Elektronen-Synchrotron, Hamburg (West Germany)). May 1966. 36p. Dep. mn.

Numerical information on coherent effects of bremsstrahlung and electron pair production in diamond crystals in the energy range from 1 to 40 Bev is presented. The information is collected in a number of graphs and tables showing the intensity and polarization of bremsstrahlung and the cross section and asymmetry ratio for pair production as a function of crystal orientation. The basic formulas for the interpretation of the diagrams are given. The experimental problem of a precise orientation of the crystal, which is closely connected with the production of coherent radiation, is discussed on the basis of these formulas. (auth)

36027 (IC-66/73) ALGEBRA OF CURRENTS AND P-WAVE NON-LEPTONIC HYPERON DECAYS. Fayyazuddin; Riazuddin (International Centre for Theoretical Physics, Trieste (Italy)). June 1966. 13p. Dep. mn.

It is shown that the chiral SU(3) ⊗ SU(3) algebra of currents and the partially conserved axial vector current hypothesis do not lead (in the current-current picture) to $\Delta I = \frac{1}{2}$ rule for the p-wave Λ and Ξ decays nor to pseudo $\Delta I = \frac{1}{2}$ rule for the p-wave Σ decay contrary to what was obtained for the s-wave decays. Instead one only obtains some relations among deviations from the $\Delta I = \frac{1}{2}$ rule and deviation from the Lee-Sugawara sum rule. (auth)

36028 (IC–66/74) CALCULATION OF THE FORM FACTORS IN K_{l3} DECAY. Bartl, A.; Korthals Altes, C. P. (International Centre for Theoretical Physics, Trieste (Italy)). June 1966. 11p. Dep. mn.

An evaluation of the form factors of the K_{l3} decay is performed by means of the SU(3) algebra of currents and the method of Fubini et al. The SU(3)-breaking corrections are calculated with help of dispersion technique, taking into account the lowest lying intermediate states. (auth)

36029 (IC–66/76) QUARK MODEL AND ELASTIC BARYON-BARYON SCATTERING. Akyeampong, D. A. (International Centre for Theoretical Physics, Trieste (Italy)). June 1966. 8p. Dep. mn.

The consequences of the quark model proposed recently by Lipkin and Scheck are investigated for baryon-baryon and baryon-antibaryon scattering. It is found that, apart from the unpleasant prediction $\sigma^{tot}(\bar{p}p) > \sigma^{tot}(\bar{p}n)$, all other predictions are in reasonable agreement with experiment. (auth)

36030 (IC–66/84) HADRON FORM FACTORS ACCORDING TO SL(6,C). Cocho, G.; Fronsdal, C.; Ar-Rashid, Harun; White, R. (International Centre for Theoretical Physics, Trieste (Italy)). July 12, 1966. 8p. Dep. mn.

The calculation of the charge form factor of the pion according to SL(6,C) is reported. Results indicate existence of a large charge radius. (B.G.D.)

36031 (ITEF-398) MASSOVYE FORMULY DLYA CHASTITS SO SPINOM 1 I $^3/_2$ v NARUSHENNOI SU(3) SIMMETRII. (Mass Formulas for Particle with Spin of 1 and $^3/_2$ in SU(3) Broken Symmetry). Vainshtein, A. T. (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii, SSSR, Moscow. Institut Teoreticheskoi i Eksperimental'noi Fiziki). 1965. 12p. Dep. mn.

Mass relations linear in masses in the case of $^3/_2^+$ baryons and quadratic for vector mesons are derived using the covariant approach to the study of broken SU(3) symmetry based on the equal time commutators and dispersion relations. (auth)

36032 (ITEF-401) ISSLEDOVANIE OBMENNOGO RASSEYANIYA $\pi + p \rightarrow \pi^0 + n$ PRI IMPUL'SE 2.8 GZV/S. (Investigation of Charge-Exchange $\pi^- + p \rightarrow \pi^0 + n$ Reaction at 2.8 Gev/c). Barmin, V. V.; Dolzolenko, A. G.; Meshkovskii, A. G.; Shebanov, V. A. (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow. Institut Teoreticheskoi i Eksperimental'noi Fiziki). 1965. 15p. Dep. mn.

The reaction $\pi^- + p \rightarrow \pi^0 + n$ was investigated at $p_{\pi^-} = 2.8$ Bev/c. The total cross section for this reaction is $\sigma = 0.35 \pm 0.04$ mb. There are two maximum in the angular distribution $d\sigma/d\Omega$. Besides the first maximum around 0° there is the second one in interval $0.3 < \cos\theta < 0.45$. It is correspondent to the square of the transfer momentum $t \cong -1.4$ (Bev/c)^2. The value $d\sigma/d\Omega$ at 0 and 180° equal 220 ± 30 μb/sr and 5 ± 5 μb/sr, respectively. (auth)

36033 (JINR–E-2743) PHASE-SHIFT ANALYSIS OF NUCLEON-NUCLEON SCATTERING AT 400 Mev. Kazarinov, Yu. M.; Legar, F.; Yanout, Z. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1966. 16p. Dep. mn.

New experimental data were used to specify the phase-shift analysis of the nucleon-nucleon scattering at 400 Mev. As a result of this specification two phase-shift sets remain from the previously obtained three ones. (auth)

36034 (JINR-P-2744) TORMOZNOE IZLUCHENIE ELEKTRONOV S E = 2.4 Gev. (Bremsstrahlung of Electrons With E = 2.4 Gev). Bem, Ya.; Grishin, V. G.; Ryabtsov, V. D. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1966. 12p. Dep. mn.

Bremsstrahlung of the electrons with E = 2.4 Bev was investigated with a 24-liter propane chamber. 179 events of electron-proton interaction were found, when the bremsstrahlung γ-quantum has $E_\gamma \geq 0.75$ E. Experimental data agree with the theoretical calculations. (auth)

36035 (JINR–P-2757) K VOPROSU OB ELEKTROMAGNITNYKH FORMFAKTORAKH NUKLONOV I MINIMAL'NOM VZAIMODEISTVII KVARKOV. (On Electromagnetic Form Factors of Nucleons and Minimal Interaction of Quarks). Matveev, V. A.; Shelest, V. P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1966. 6p. Dep. mn.

A correct relation between electric and magnetic form factors of nucleons in the model of complex particles is obtained on the basis of the minimal quark interaction. (auth)

36036 (LNF-66/20) η PHOTOPRODUCTION CROSS SECTION FOR INCIDENT PHOTON ENERGIES 800 TO 1000 Mev. Note No. 318. Bacci, C.; Mencuccini, C.; Penso, G.; Salvini, G.; Silvestri, V. (Laboratori Nazionali di Frascati, Comitato Nazionale per l'Energia Nucleare (Italy)). Mar. 20, 1966. 30p. Dep. mn.

Photoproduction cross section of the η particle for incident photon energies K from ~800 to ~1000 Mev was measured at the 1.1 Bev Frascati electronsynchrotron. The differential cross section for this purpose, at c.m. angle of the η of ~110°, turns out to be fairly constant for 830 Mev ≤ K ≤ 900 Mev, and drops down of a factor 5 to 10 at K = 950 Mev. These results are discussed in terms of a comparison with the data on the production of η's by pions, and with the data on pion-nucleon scattering and pion photoproduction. The conclusions are in agreement with the hypothesis that the η-N system is dominated at low energies by a resonance with orbital angular momentum $1 = 0_{\frac{1}{2}}(S_{\frac{1}{2}}$, resonance). (auth)

36037 (LNF-66/23) ASYMMETRY RATIOS IN THE PHOTOPRODUCTION OF π^+ BY LINEARLY POLARIZED γ RAYS IN THE ENERGY RANGE 200 TO 400 Mev. Note No. 320. Gorenstein, P.; Grilli, M.; Nigro, M.; Schiavuta, E.; Soso, F.; Spillantini, P.; Valente, V. (Laboratori Nazionali di Frascati, Comitato Nazionale per l'Energia Nucleare (Italy)). Apr. 13, 1966. 6p. Dep. mn.

The asymmetry ratio was measured for the reaction $\gamma + p \rightarrow n + \pi^+$ for gamma energies of 200 to 400 Mev. (B.G.D.)

36038 (N–66-18122) SOME APPLICATIONS OF THE ALGEBRA OF CURRENT TO ELECTROMAGNETIC INTERACTIONS. Gourdin, M. (Paris Univ., Orsay (France). Laboratoire de Physique Theorique et Hautes Energies). Jan. 1966. 23p. (TH–127). CFSTI $1.00 cy, $0.50 mn.

Sum rules involving electroproduction reactions on protons can be obtained using the method first described for high energy neutrino reactions. The invariant differential cross section for electroproduction is discussed for the one photon exchange approximation and general sum rules are derived. Also, the Lee commutation relations are discussed for the magnetic moment operator associated with baryons and excited baryons and for pseudoscalar mesons and vector mesons. The reduced matrix elements are defined and the significance of the Lee algebra of the space integrals is considered in terms of SU(6) unitarity. (STAR)

36039 (N–66-18134) PION ELECTROPRODUCTION. Loubaton, J. P. (Paris Univ., Orsay (France). Laboratoire de Physique Theorique et Hautes Energies). Jan. 1966. 12p. (TH–128). CFSTI $1.00 cy, $0.50 mn.

Electroproduction is discussed in terms of the one photon exchange approximation. Electroproduction is shown to appear like a photoproduction induced by a spacelike photon, the polarization of which may be longitudinal as well as transverse. Electroproduction provides a tool for the study of the electromagnetic form factors of nucleons. Experimental data are interpreted in terms of the theory proposed. (STAR)

36040 (NYO–2262TB-125) PROGRESS REPORT OF THE RESEARCH PROGRAM IN EXPERIMENTAL HIGH-ENERGY PHYSICS. Shapiro, Anatole M. (Brown Univ., Providence, R. I. Dept. of Physics). June 1, 1966. Contract AT(30-1)-2262. 13p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

An investigation was made of the neutral final states formed in π^--p collisions in the energy range 1.1 to 3.8 Bev. Also a $\bar{p}$-p bubble chamber experiment was performed in the Bev range. An analysis of data from these experiments is in progress. (M.O.W.)

36041 (ORO–2504-90) MEASUREMENT PROCESSING FOR CHARGED SIGMA PRODUCTION REACTIONS NEAR 1 Bev/c. Technical Report No. 559. Charlton, Gordon R. (Maryland Univ., College Park. Dept. of Physics and Astronomy). Apr. 1966. Contract AT(40-1)-2504. 51p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

A computing technique for analyzing the data from meson (K^-) decays is described in detail. The code analyzes the production of $\Sigma^\pm$ in two- and three-body decays. (M.O.W.)

36042 (TID–23191) A STUDY OF SELECTED FINAL STATES IN K^-p SCATTERING AT 2 Gev/c. Dauber, Philip Mack (California Univ., Los Angeles. Dept. of Physics). [1965]. Contract AT(11-1)-34. 276p. Dep. mn. CFSTI $6.00 cy, $1.50 mn.

Thesis.

A study of the final states of from two to five particles resulting from collisions of K^- mesons with protons at incident momenta between 1.7 and 2.1 Bev/c is presented. (B.G.D.)

36043 (TID–23206) ANNUAL PROGRESS REPORT [ON PARTICLE PHYSICS]. Haddock, Roy P. (California Univ., Los Angeles. Dept. of Physics). May 10, 1966. Contract AT(11-1)-34. 10p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Continuing progress is described for the following research studies: analysis of $2n\gamma$ data taken from $\pi^- + d \rightarrow 2n + \gamma$ experiment, K^+ decay spectra, slow π^- reactions in hydrogen, time reversal invariance in K_{μ_3} mode of the K_2^0 meson, and polarized proton targets. No significant data are given. (M.O.W.)

36044 (UCRL-16744) THE A_1 AND K** (1320) PHENOMENA: KINEMATIC ENHANCEMENTS OR MESONS? Goldhaber, Gerson; Goldhaber, Sulamith (Lawrence Radiation Lab., Univ. of California, Berkeley). Mar. 1966. Contract W-7405-eng-48. 66p. (CONF-660103-1). Dep. mn. CFSTI $3.00 cy, $0.75 mn.

From 4th Anniversary Symposium on Resonant States of Elementary Particles, Madras.

The similarity between the well-known A_1 phenomenon and the more recently discovered K** (1320) phenomenon is discussed. The assignment of kinetic enhancements or mesons to these phenomena are investigated. (B.G.D.)

36045 (UCRL–16874) A STUDY OF MULTI-CHANNEL DYNAMICS IN THE STRIP APPROXIMATION. Chu, Shu-yuan (Lawrence Radiation Lab., Univ. of California, Berkeley). May 13, 1966. Contract W-7405-eng-48. 55p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

Thesis.

A systematic study of the dynamics of scattering with several coupled two-particle channels is made using the new strip approximation. The existence of a unique solution to the ND^{-1} equations is established from maximal analyticity of the second degree. The method used is an extension of Jones' proof in the single-channel case, making use of an explicit expression for the determinant of D constructed by Gross. The general method is then applied to the particular case of a $\pi\pi$-$K\bar{K}$ two-channel calculation of the ρ-meson, first with fixed-spin particle and then with Reggeized particle exchange as the generalized potential. A detailed discussion of the numerical result is presented with the conclusion that the effect of the inelastic channel ($K\bar{K}$) is not important in the present approximation scheme. (auth)

36046 INTERACTION OF γ RADIATION WITH MATTER. Davisson, C. M. pp 37-78 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

A summary and brief description of most of the processes by which gamma rays interact with matter are given. Pair production, photoelectric effect, scattering by electrons, Compton effect, nuclear interactions, and Delbruck scattering are discussed. Absorption methods used to determine attenuation coefficients of gamma rays are treated. 210 references. (L.B.S.)

36047 ON THE DISINTEGRATION OF A PAIR OF NEUTRAL K-MESONS. Soederholm, Lars (Univ. of Stockholm). Ark. Fys., 32: 471-8(1966).

An experiment has shown that the simple theory by Gell-Mann and Pais on the decay of a neutral K-meson is basically wrong. Probably either the assumption of CP invariance or some fundamental quantum mechanical principle is false. The decay of a pair of neutral kaons (as produced for instance by a π^+ and a π^-) is studied. A simple CP noninvariant field-theoretic model is discussed and the nonlinear (i.e., violating the superposition principle) but CP invariant theory by Laurent and Roos is extended to the case of two K-mesons. (auth)

36048 DECAY OF A MESON WITH STRANGENESS AND NO ISOSPIN INTO $K\bar{K}\pi$. Vandermeulen, J. (Univ., Liege). Bull. Soc. Roy. Sci. Liege, 35: No. 1-2, 64-75 (1966). (In French).

The method of the phenomenological analysis of an unstable state decaying into $K + \bar{K} + \pi$, obtained by extension of the procedure used in the decay into 3π, is explicitly described. A model is established to interpret the production of the E meson in the proton-antiproton annihilation and its fast decay; the results of numerical calculation are compared with experimental data. (tr-auth)

36049 SYSTEM OF ELEMENTARY PARTICLES. Elistratov, P. N. Byull. Vses. Astron.-Geod. Obshchest., No. 36, 15-21(1965). (In Russian).

A scheme is described for constructing all particles and antiparticles from one basic particle (positive and negative photons of mass 300 electron masses), assigning these basic particles to energy levels. Configurations having an odd number of filled levels were bosons, and those having an even number of filled levels were fermions. The meson (μ) was considered a boson. Isotopic doublets of particles and antiparticles consisting of four members: a charged particle and its antiparticle and a neutral particle and its antiparticle were defined. The hyperons ($\Sigma^\pm$) were treated as charged isotopes of the λ particles and antiparticle, and the neutrino was treated as the neutral isotope of the electron. (J.F.P.)

36050 CHOICE OF F OR G ELECTROMAGNETIC FORM FACTORS. Kessler, Paul (College de France, Paris). Compt. Rend., Ser. B, 262: 1473-6(June 13, 1966). (In French).

The selection of G_E and G_M as electromagnetic form factors of the nucleon is submitted to a critical analysis. (tr-auth)

36051 SYSTEMATICS OF PARTICLE RESONANCES. Rusak, B. I. (Nizami Tashkent State Pedagogical Inst., USSR). Izv. Akad. Nauk Uz. SSR, Ser. Fiz.-Mat. Nauk, No. 3, 69-71(1965). (In Russian).

It is proposed that muons and pions form elementary particles without substantial mass defects. In this case an even-even set of μ- and $\pi^\pm$-mesons corresponds to the doublet particles; an even-odd set corresponds to triplet particles, and an odd-even set corresponds to quadruplet particles. In some cases it is assumed that part of the muons and pions are grouped in kaons. Except in two cases the calculated values of the 33 strange particles agree with the experimental values. All resonance particle decays reduce to muon annihilation, or to the annihilation or charge transfer of pions. (TTT)

36052 Ω-HYPERON PROPERTIES. Rusak, B. I. (Nizami Tashkent State Pedagogical Inst., USSR). Izv. Akad. Nauk Uz. SSR, Ser. Fiz.-Mat. Nauk, No. 3, 71(1965). (In Russian).

It is thought that the omega hyperon is formed by the reaction: (1) $K^- + p \rightarrow \Omega^- + K^+ + K^0$, and that it decays by the reaction: (2) $\Omega^- \rightarrow \Xi^0 + \pi^-$. These equations are satisfied, if it is assumed for the new hyperon that T = 0 and S = –3. Then, T, T_3, and S are conserved in (1) and in reaction

(2) $\Delta S = +1$, $\Delta T = \frac{1}{2}$ and $\Delta T_3 = 0$. If the structure of elementary particles does not allow charged singlets, the formation of the omega hyperon can proceed as follows: (3) $K^+ + p \rightarrow \Omega^- + K^+ + \widetilde{K}^0$. In this case the new hyperon is characterized by values of $S = -1$ and $T = 1$, so that we have $\Delta S = -1$, $\Delta T = \frac{1}{2}$ and $\Delta T_3 = -\frac{1}{2}$ in reaction 2. The triplet scheme of the omega hyperon gives a calculated mass of 1685.8 Mev. (TTT)

36053 DIPOLE-DIPOLE INTERACTIONS IN SLOW NEUTRON SCATTERING ON PROTONS. Khrushchev, B. I. (Inst. of Nuclear Physics, Academy of Sciences, Uzbek SSR). Izv. Akad. Nauk Uz. SSR, Ser. Fiz.-Mat. Nauk, No. 4, 73-8(1965). (In Russian).

The spin-flip probability for slow polarized neutrons interacting with unpolarized protons is calculated for the use of an external uniform magnetic field. The dipole-dipole differential cross section and the total cross section are also calculated. (G.O.Y.)

36054 ANOMALOUS BREMSSTRAHLUNG AND RENORMALIZED KINETIC EQUATION. Baus, M. (Univ. Libre, Brussels). Phys. Fluids, 9: 1427-8(July 1966).

The anomalous term found recently in the collision integral for bremsstrahlung is eliminated through a redefinition of the distribution function leading to dynamically dressed field oscillators. (auth)

36055 CONJECTURE FOR THE T = 0, S-WAVE, π-π PHASE SHIFT. Cook, L. F. (Univ. of Massachusetts, Amherst). Phys. Rev. Lett., 17: 212-15(July 25, 1966).

An alternative to Chew's (Phys. Rev. Lett., 16: 60(1966)) conjecture for this phase shift is suggested, that is, that the phase shift drops through $\sim 3\pi/2$ as the energy increases from the threshold to the ρ resonance. This alternative leads to the forward asymmetry of the ρ^0, is not inconsistent with the experimental phase shifts, and will lead to a marked enhancement of the $\pi^+\pi^-$ invariant-mass distribution at low energies. (M.H.R.)

36056 ETA-MESON BRANCHING RATIO INTO $\pi^0 + \gamma + \gamma$. Wahlig, M. A. (Massachusetts Inst. of Tech., Cambridge); Shibata, E.; Mannelli, I. Contract AT (30-1-2098). Phys. Rev. Lett., 17: 221-3(July 25, 1966).

An upper limit of 0.50 (90% confidence level) is set for the branching ratio $(\eta \rightarrow \pi^0 + \gamma + \gamma)/(\eta \rightarrow \gamma + \gamma)$ in a spark-chamber experiment measuring $\pi^- + p \rightarrow (n + 4\gamma$ and $n + 2\gamma)$ at 10 Bev/c. This disagrees with a recent measurement of 0.90 ± 0.10 for the same ratio. (auth)

36057 MEASUREMENT OF THE Σ^+ MAGNETIC MOMENT. Cook, V.; Ewart, T.; Masek, G.; Orr, R.; Platner, E. (Univ. of Washington, Seattle). Phys. Rev. Lett., 17: 223-8(July 25, 1966).

The precession of polarized sigmas in a magnetic field was measured by observing the asymmetric decay, $\Sigma^+ \rightarrow \pi^0 + p$. The value $\mu_\Sigma = 1.5 \pm 1.1$, obtained in this experiment, is in agreement with the predictions within the limited accuracy, and the experiment indicates there are no large anomalies. (M.H.R.)

36058 POSITRON ANNIHILATION IN THE (e^+,Na) SYSTEM. Hoang, Tin Wang (Belorussian State Univ., Minsk). Teor. Eksp. Khim., 11: 260-3(Mar.-Apr. 1966). (In Russian).

The variation wave function method, developed previously for the (e^+,Li) system, was used to calculate the annihilation probability of positrons in the (e^+,Na) system. The presence of $2s^2$, $2p^6$ shells complicated the calculation, which indicated that the bond energy of the positron with the Na atom is 0.544 ev, and the lifetime of the positron, obtained on the basis of the two-photon annihilation with optical electrons, is 3.28×10^{-10} sec. The two-photon annihilation probability of the positron, w, and the corresponding probability of free electron or positron annihilation, w_{pos}, are interrelated as $w = 0.38\ w_{pos}$. Results indicated that the annihilation probability of the positron decreases, i.e., the lifetime, r, increases going from Li to Na. This is due to the decrease of the spin factor as the number of shell electrons increase. Thus, generally speaking, the annihilation probability decreases from lithium toward cesium. (TTT)

36059 MULTIPLE MESON PRODUCTION. Takagi, S. (Kyoto Univ.); Dake, S. Uchusen-Kenkyu, 11: 65-85(Apr. 1966).

A statistical model of multiple meson production is proposed, in which the constancy of $\bar{p}_T$, the transverse momenta of generated mesons, is taken into account and which is more consistent and comprehensive than the similar model proposed by a Polish group. In the high energy limit the following asymptotic behaviors are predicted: (i) secondary pions have a uniform logtan θ distribution, (ii) multiplicity of secondary pions has a logarithmic dependence on the total available energy of the system. The angular distribution and the multiplicity of secondary pions for finite available energy are also predicted and, on the assumption of $\bar{p}_T = 400$ Mev/c and K = 0.5, the prediction reproduces the experimental results very well in a wide incident nucleon momentum region, 2×10^{10} ev/c $\lesssim P_0 \lesssim 2 \times 10^{12}$ ev/c, discussion is presented to show that the essential average feature of ultrahigh energy nucleon-nucleon interaction is condensed in the constancy of $\bar{p}_T$. (auth)

Field Theory, Scattering Theory, and Symmetries

See also Elementary Particles and Radiations

36060 (CERN-66-19) $SU_2 \rightarrow SU_3 \rightarrow SU_6$. Weisskopf, V. F. (European Organization for Nuclear Research, Geneva (Switzerland)). May 24, 1966. 80p. Dep. mn.

A simple and primitive description of unitary symmetries as applied to high-energy physics is presented by building the way up from SU(2) to SU(3), and eventually to SU(6). (B.G.D.)

36061 (COO-264-308) TRIPLETS, STATIC SU(6), AND SPONTANEOUSLY BROKEN CHIRAL SU(3) SYMMETRY. Nambu, Y. (Chicago Univ., Ill.). Jan. 1966. Contract AT(11-1)-264. 10p. (CONF-650947-4; EFINS-66-19). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Elementary Particles, Kyoto.

Current problems in elementary particle theory are examined in relation to recent successes of SU(3) and SU(6) symmetries. (B.G.D.)

36062 (DESY-66/14) CAN CURRENT OPERATORS DETERMINE A COMPLETE THEORY? Langerholc, J.; Schroer, B. (Deutsches Elektronen-Synchrotron, Hamburg (West Germany)). May 1966. 22p. Dep. mn.

For the free field currents $j_\mu(x)$ in the sector of charge zero we prove that one can reconstruct the bilocal fields $\psi(x)\ \bar{\psi}(y)$. (auth)

36063 (IC-66/65) TESTS OF MODELS OF ELEMENTARY PARTICLES. Okubo, Susumu (International Centre for Theoretical Physics, Trieste (Italy)). June 1966. 37p. Dep. mn.

By means of the algebra of currents, the validity of models of elementary particles were tested. From studies of the decay rate of $\pi_0 \rightarrow 2\gamma$, a calculation of the axial vector renormalization constant g_A, the decay rates of $V_9 \rightarrow l + \bar{l}$ and those of $V_9 \rightarrow P_8 + \gamma$ decays, it was concluded that the fractionally charged quark model of Gell-Mann and Zweig is the best candidate among all others. (auth)

36064 (IC-66/70) PARTIAL CONSERVATION OF TENSOR CURRENTS AND PAULI INTERACTION. Krolikowski, W. (International Centre for Theoretical Physics, Trieste (Italy)). June 1966. 11p. Dep. mn.

It is shown that the form of the partial conservation of tensor currents (PCTC) proposed in some recent papers should be modified if, for the momentum transfer equal to zero, matrix elements of tensor currents have to be finite and vector meson vertices different from zero. (auth)

36065 (IC–66/71) DISCRETE SERIES OF HERMITIAN REPRESENTATIONS OF THE LIE ALGEBRA OF U(p,q). (Lecture Notes). Todorov, I. T. (International Centre for Theoretical Physics, Trieste (Italy)). June 1966. 36p. Dep. mn.

The method of Gel'fand and Graev is described for the construction of the discrete series of hermitian representations of the Lie algebra of U(p,q). A generalization of the original Gel'fand-Graev prescription is proposed to include the most degenerate discrete series in the set under consideration, but still no complete description of all discrete hermitian representations of the algebra is given. Three of the most degenerate discrete series which seem to be of physical interest are treated in more detail both by the generalized Gel'fand-Graev method and in terms of creation and annihilation operators. (auth)

36066 (IC–66/80) QUARK MODEL DERIVATION OF MESON-BARYON COUPLING CONSTANT RELATIONS. Rivers, R. J. (International Centre for Theoretical Physics, Trieste (Italy)). July 4, 1966. 9p. Dep. mn.

Using a simple quark model for baryon-meson vertices, coupling constant relations are derived such that under certain circumstances are the same as those derived from current algebra. (auth)

36067 (IC–66/81) ON FACTORIZATION OF EINSTEIN'S FORMALISM INTO A PAIR OF QUATERNION FIELD EQUATIONS. Sachs, M. (International Centre for Theoretical Physics, Trieste (Italy)). July 1966. 15p.

It is proposed that a full exploitation of the principle of general relativity in the construction of the metrical field equations implies that the fundamental variables should be quaternion fields rather than the metric tensor field of the conventional formulation. Thus, the tensor property of Einstein's formalism is replaced here by a formalism that transforms as a quaternion–a vector field in coordinate space and a second-rank spinor field of the type $\eta \otimes \eta^*$ in spinor space. The geometrical field variables of the Riemann space are derived in quaternion form. The principle of least action (with the Palitini technique) is then used to derive a pair of time-reversed quaternion field equations, from the (quaternionic form of) Einstein's lagrangian. It is then shown how the conventional tensor form of the Einstein formalism is recovered from a particular combination of the derived time-reversed quaternion equations. (auth)

36068 (IC–66/85) MULTIPLE FIELD RELATIONS. Delbourgo, R.; Salam, Abdus; Strathdee, J. (International Centre for Theoretical Physics, Trieste (Italy)). July 12, 1966. 10p. Dep. mn.

A common basis for three elements of particle theory; higher symmetry multiplets, a postulated algebra for weak currents, and PCAC and similar hypotheses, is suggested. The basis is established by postulating (with Heisenberg) that there exists fundamental fields and all matter is made up from them. (B.G.D.)

36069 (IC–66/86) A NEW FAMILY OF SUM RULES FROM CURRENT ALGEBRA. Amati, D.; Jengo, R.; Remiddi, E. (International Centre for Theoretical Physics, Trieste (Italy)). July 1966. 10p. Dep. mn.

A new family of sum rules based on the algebra of currents is proposed and some of its physical implications discussed. (B.G.D.)

36070 (IC–66/87) ON THE ALGEBRAIC FORMULATION OF DYNAMICAL MODELS. Bisiacchi, G.; Budini, P. (International Centre for Theoretical Physics, Trieste (Italy)). July 1966. 18p. Dep. mn.

An algebraic method for the solution of some dynamical problems for a nonrelativistic system with known symmetry properties is given, in the case of the so-called broken symmetry. Examples of soluble models are given. One of these, based on the non-compact group Sp(6,R), gives a mass formula for baryons depending on three parameters which reproduces the known masses within electromagnetic mass differences. The model implies the relation $(Y^* - \Sigma)/\Sigma - \Lambda) = (5/2)$ in good agreement with experiment. The mass formula in the model can be considered as an eigenvalue solution of a differential equation in an appropriate Riemannian manifold. Relation with the proposed models and charge algebras is discussed. (auth)

36071 (IFA-FT–58) A GENERAL SOLUTION OF THE ONE-CHANNEL SCATTERING SINGULAR INTEGRAL EQUATIONS. Ciulli, S.; Ghika, Gr.; Stihi, M.; Visinescu, M. (Institutul de Fizica Atomica, Academia R. P. R., Bucharest (Romania)). 1966. 44p. Dep. mn.

Integral equations for the one-channel scattering are written and solved, starting from dispersion relations for the generalized Jost function in the momentum k-plane. This method is an alternative to the conventional N/D method, but it allows a simple, physically meaningful generalization to the many-channel case, where dispersion relations and integral equations can be written for a unique generalized Jost function in the complex plane of a suitable variable which uniformizes all the right cuts of the scattering amplitude. Even in the pure elastic scattering case, a unified treatment is possible for both cases, when the phase shift at infinity is or is not an integral multiple of π. In all cases, our singular integral equations are reduced to a Fredholm-type integral equation with a Hilbert-Schmidt kernel. (auth)

36072 (IFA-FT–59) REPRESENTATION OF THE INFINITESIMAL UNITARY GROUPS BY INFINITESIMAL CANONICAL TRANSFORMATIONS. Titeica, S. (Institutul de Fizica Atomica, Academia R. P. R., Bucharest (Romania)). 1965. 29p. Dep. mn.

The problem of the representation of any infinitesimal Lie group by infinitesimal canonical transformations is formulated then it is solved by recurrence in the special case of the unitary groups of arbitrary dimensionality. (auth)

36073 (ITEF–395) KRANTOVAYA TEORIYA POLYA S INDEFINITNOI METRIKOI V GIL'BERTOVOI PROSTRANSTVE. (Quantum Field Theory with Indefinite Metrics in Hilbert Space). Galanin, A. D. (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow. Institut Teoreticheskoi i Eksperimental'noi Fiziki). 1965. 24p. Dep. mn.

A system of equations in functional derivatives was plotted for the four-fermion interaction provided the anticommutator in the cone vertex is C-number, its dependence on the coordinates being not concretized. Proceeding from the formal solution of these equations in the form of continual integral, it is shown that the exclusion of δ – functions from the commutation relations which is possible at indefinite metrics, must not mean the exclusion of any singularities of the anticommutator in the cone vertex. Otherwise, it identically vanishes in the whole space. It is pointed out that the generalization of usual interpretation of continual integral from the mechanical system on the field, leads to the restrictions on commutation relations. In particular, it forbids canonic quantization in the case of the four-fermion interaction. To describe the anticommutation singularity in the cone vertex, a new generalized function should be introduced. This function is determined by integration rules with the functions which are singular solutions of the classical field equation. The scheme enclosed is not hamiltonian since it is impossible to plot the total system of commuting operators on the spatially similar surface. (auth)

36074 (ITEF–417) VZAIMODEISTVIE PRI VYSOKOI ENERGII (TEORIYA KOMPLEKSNYKH MOMENTOV I EKSPERIMENT). (Interactions at High Energy (Theory of Complex Moments and Experiment)). Ter-Martirosyan, K. (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow. Institut Teoreticheskoi i Eksperimental'noi Fiziki). 1966. 121p. Dep. mn.

The experimental data on particle interactions at high energy (up to $E_{lab} \sim 30$ Bev) are considered using the complex momenta theory and its simplest form–Regge pole model. It is shown that all the data available are in good agreement with the theory. (M.O.W.)

36075 (JINR–E–2714) SYMMETRY BREAKING QUASI-PARTICLE METHOD FOR BARYONS AND FOR QUARKS. I. BOUND STATE PROBLEM. Vol'rab, K. S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1966. 24p. Dep. mn.

The quasiparticle method is applied to a SU_3 symmetric four-fermion interaction between octet baryons N and antibaryons $\bar{N}$ (or between quarks and antiquarks). The physical particles and resonances themselves appear as quasiparticles. The form of the individual quasiparticle operators is $\Omega = uN + v\bar{N}^*$. Applications are made to the baryon spectra. Spontaneous dynamical symmetry-breaking of SU_3 appears and leads to a Gell-Mann-Okubo formula in the strong coupling limits (similar results for quarks). Higher-order quasiparticles, especially the octet-meson spectra, are studied in the roughest approximation. (auth)

36076 (JINR–P–2696) SOKHRANYAYUSHCHIESYA TENZORNYE TOKI I RELYATIVISTSKAYA STRUKTURA GRUPPY SU(6). (Hypothesis of Conserved Tensor Currents and SU(6) Group). Ogievetskii, V. I.; Polubarinov, I. V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1966. 40p. Dep. mn.

It is shown that conserved tensor currents generate SU(6) transformations. A relation is established between the constructed currents and the so called algebra of currents. The relativised transformations of 35–56–189 plet quarks obtained leave free equations invariant, but should be modified in the case of interaction. In the true theory involving interaction the transformations and currents are likely to become essentially nonlinear. Only if applied to one-particle states and static effects a future true group will be reduced to SU(6). Under the hypothesis that tensor currents are essentially sources of 2^+ fields the fundamental role of the 189 supermultiplet is pointed out. (auth)

36077 (N–66–18121) SOME SIMPLE REMARKS ABOUT THE SCATTERING BY A THREE-BODY POTENTIAL. Pasquier, J. Y. (Paris Univ., Orsay (France). Laboratoire de Physique Theorique et Hautes Energies). Jan. 1966. 12p. (TH–122). CFSTI $1.00 cy, $0.50 mn.

Quantum mechanical wave functions are considered for scattering by a three-body potential. The special case of the interacting three-particle system is treated in such a manner to illustrate in an explicit way the relation between the quantum number and the togetherness of the configuration of the three-particle system. (STAR)

36078 (N–66–18151) WEAK INTERACTIONS AND SYMMETRIES. d'Espagnat, B. (Paris Univ., Orsay (France). Laboratoire de Physique Theorique et Hautes Energies). Nov. 1965. 75p. CFSTI $3.00 cy, $0.75 mn.

A review is presented of recent applications of group theory, and particularly of unitary symmetry, to the problem of weak interactions. Included are discussions in such areas as semi-leptonic $\Delta s = 0$ and $\Delta s \neq 0$ interactions; $\Delta s \neq 0$ nonleptonic interactions; the Goldberger-Treiman formula; the $K^0, \bar{K}^0$ complex; currents and their use; currents and renormalization effects; and SU_3 generalities. (STAR)

36079 ANALOGY BETWEEN LORENTZ TRANSFORMATIONS AND THE DIAGONALIZATION OF PARTICLES. Biel, J. (Univ., Barcelona). An. Real Soc. Espan. Fis. Quim. (Madrid), Ser. A, 62: 119-27(May-June 1966). (In Spanish).

A relation between the generalized Foldy-Wouthuysen and the special Lorentz transformations for spin 0, ½, or 1 particles is shown. (auth)

36080 THEORY OF ELEMENTARY PARTICLES. Akulov, N. S. (Div. of Physics, Academy of Sciences, Belorussian SSR). Dokl. Akad. Nauk BSSR, 10: 151-5 (Mar. 1966). (In Russian).

The following model is presented: a system consisting of a particle revolving about a center (kernel) along an orbit with a diameter on the order of 10^{-13} may exist in various states characterized by quantum numbers – spin (S = 0, ±½), lepton (L = 0, ±1), "charge" (l = 0, ±1) (in units of proton charge), "muon" (m = 0, ±1), baryon (B = 0, ±1). Such a model corresponds to leptons when B = 0. When B = 1, however, there appear special particles — "rheons" — for which the system of quantum numbers is the same as that of leptons. These rheons, i.e., fundamental particles with integer-valued charge, actually exist. Owing to the interpenetration between lepton "clouds" (in neighboring rheons) they behave within baryons like particles with the fractional charges $+\frac{2}{3}$ and $-\frac{1}{3}$, but the products of the decay cannot have any fractional charge. On this basis, and based on the principle that all particles differ from each other by the composition of their quantum numbers, a classification of the structures of all elementary particles is presented. (JPRS)

36081 POLES OF THE S MATRIX FOR LONG-RANGE POTENTIALS. Ferreira, Erasmo M.; Teixeira, Antonio F. F. (Univ. Central de Venezuela, Caracas). Notas Fis., Centro Brasil. Pesquisas Fis., 11: 261-98(1965).

The analytic properties in the complex k-plane of the S-matrix for scattering by a screened Coulomb potential are studied. Particular attention is given to the limit as the screening radius tends to infinity, so as to show in an explicit example the effect of the tail of the potential on the properties of the analytically extended S-matrix. It is shown that the pole configuration obtained in this way is different from that obtained in the usual description of the analytic properties of the Coulomb S-matrix. (auth)

36082 REDUCTION OF THE FINITE-RANGE THREE-BODY PROBLEM IN TWO VARIABLES. Osborn, T.; Noyes, H. Pierre (Stanford Univ., Calif.). Phys. Rev. Lett., 17: 215-18(July 25, 1966).

It is shown explicitly that for finite-range two-body forces which contribute significant interactions in only L + 1 orbital angular momentum states, the Faddeev equations for the three-body T matrix with total angular momentum J can be reduced to well-defined integral equations for functions of two continuous variables with $3(L + 1) \times \min(2J + 1, 2L + 1)$ components. Hence numerical calculation for realistic interactions, and analytic investigation of the dependence on two-body dynamics (which is explicitly separated from the geometrical part of the problem), become possible. (auth)

36083 WICK ROTATION IN THE BETHE-SALPETER EQUATION. Pagnamenta, A.; Taylor, J. G. (Rutgers-The State Univ. of New Jersey, New Brunswick). Phys. Rev. Lett., 17: 218-20(July 25, 1966).

A systematic and practical method to remove completely all the singularities in the Bethe-Salpeter kernel is presented. This is an extension of Wick rotations into the elastic, simply inelastic, etc., regions which takes account not only of displaced poles but also of displaced cuts. (M.H.R.)

Fluid Physics and Thermodynamics

See also Plasma Physics and Thermonuclear Processes

Refer also to abstract 35626.

36084 (AD–631672) INVESTIGATION OF THE INTERACTION OF AN EXTERNAL MAGNETIC FIELD WITH AN ELECTRIC ARC. Olsen, H. N.; Maldonado, C. D.; Duckworth, G. D.; Caron, A. P. (Northrop Space Labs., Hawthorne, Calif.). Jan. 27, 1966. Contract AF33(615)-1105. 109p. (ARL–66–0016). CFSTI $4.00 cy, $0.75 mn.

A unique method was formulated mathematically for inverting the integral equation relating the integrated spectral intensity to the internal emission coefficient for any general geometry of an optically thin plasma. The method, specialized to the case of one mirror plane of symmetry, was programmed for the IBM 7090 and properly tested by means of assumed analytical models. To demonstrate the practical nature of the inversion method as a research tool it was used to measure, for the first time, the absolute emission coefficient of the λ6965 atomic spectral line emitted by the 400 ampere ar-

gon arc when distorted by a 36 Gauss external magnetic field. The computer program and test sample are included in the report. (auth)

36085 (LA–3466) PARTICLE-IN-CELL METHOD FOR THE CALCULATION OF THE DYNAMICS OF COMPRESSIBLE FLUIDS. Amsden, Anthony A. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). Feb. 1966. Contract W-7405-eng-36. 170p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

An extensive discussion of the Particle-in-Cell computing method for solving nonsteady two-dimensional fluid dynamics problems is presented. The topics treated include boundary conditions, numerous properties of the method, its applicability and limitations, and the inclusion of additional physical effects, such as the full viscous stress tensor which is discussed for the first time. Flow diagrams for a PIC code and examples of several calculational results are also presented. (auth)

36086 (UCRL–14931) ONE-DIMENSIONAL MAGNETOHYDRODYNAMICS CODE. Steinberg, Daniel (Lawrence Radiation Lab., Univ. of California, Livermore). June 7, 1966. Contract W-7405-eng-48. 48p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

A description of MAGPIE, a one-dimensional magnetohydrodynamic code which includes thermal diffusion—both heat conduction and radiation flow is presented. It was designed to operate in cylindrical geometry and can treat either the H(z) or H(θ) case, but not both simultaneously. It can approximate a 1-D Cartesian system by taking as the first zone a void with a large radius. Provision has been made in the code to include an external RLC circuit in which it is possible to short-circuit, or crowbar, the capacitor when its charge reaches zero. (B.G.D.)

36087 INSTABILITY OF LAMINAR FLOW OF A PERFECT MAGNETOFLUID. Kent, Arthur (Glasgow Univ.). Phys. Fluids, 9: 1286-9(July 1966).

A simple sufficient condition is given for instability against small oscillations of symmetric laminar flows of an inviscid incompressible perfectly conducting magnetofluid, flowing between parallel walls in the presence of a symmetric magnetic field parallel to the flow. The condition is interesting because it shows that any such flow that is stable in the absence of a magnetic field can be made unstable by the superposition of a suitable magnetic field parallel to the flow. (auth)

36088 ALFVEN WAVES IN A STRATIFIED INCOMPRESSIBLE FLUID. Pridmore-Brown, D. C. (Aerospace Corp., El Segundo, Calif.). Phys. Fluids, 9: 1290-2(July 1966).

Alvén wave propagation is studied in an incompressible fluid stratified by an inhomogeneous fluid density or magnetic field strength. It is shown that any disturbance splits up into two components—an ordinary Alfvén mode and a modified Alfvén mode. The first of these propagates one-dimensionally along flux tubes at the local Alfvén speed while the second propagates three-dimensionally and carries a disturbance in the total (fluid plus magnetic) pressure. (auth)

36089 BOSE-EINSTEIN PHASE TRANSITION IN AN INTERACTING SYSTEM. Luban, Marshall (Univ. of Pennsylvania, Philadelphia); Grobman, Warren D. Phys. Rev. Lett., 17: 182-5(July 25, 1966).

It is shown that for both the Hartree-Fock and Bogoliubov models of interacting bosons associated with the disappearance of the Bose-Einstein condensation at a temperature T_c, the specific heat C_V has a square root singularity, $C_V \sim A(T_c - T)^{-\frac{1}{2}}$, and the superfluid density ρ_S is discontinuous, with $\rho_S(T) - \rho_S(T_c - 0) \sim B(T_c - T)^{\frac{1}{2}}$ for temperatures $T \to T_c - 0$. Except near $T_c = T_\lambda$ the theoretical and experimental results for ρ_S are in good agreement. (auth)

36090 GLOW DISCHARGE AT LOW PRESSURES AND CURRENT DENSITIES UP TO 0.1 A/cm². Klyarfel'd, B. N.; Guseva, L. G.; Pokrovskaya-Soboleva, A. S. (Lenin All-Union Electrotechnical Inst., Moscow). Zh. Tekh. Fiz., 36: 704-13(Apr. 1966). (In Russian).

The current-voltage characteristics of glow discharges between plane parallel electrodes in Ar, H_2, Ne, and N_2 were measured at voltages from 0.2 to 30 kv, currents from 10^{-9} to 10 amp, and values of the pd product (pressure times electrode distance) corresponding to the left-hand branch, the minimum, and a portion of the right-hand branch of the Paschen curve. Measurements at intermediate currents by both the pulse and continuous techniques gave concordant results. Many of the recorded current-voltage characteristics are presented graphically and are discussed at length. Glow discharged are classified into three groups, for which the following designations are proposed: Simple (or simplest) glow discharge; dense glow discharge; and normal glow discharge. As the current is increased at low pressures, a simple glow discharge passes directly into a dense glow discharge; at higher pressures there is an intermediate range in which the glow discharge is normal. It is suggested that it may prove necessary to introduce further new terms to describe the still insufficiently investigated glow discharges for values of the pd product exceeding 100 mm Hg cm^{-1}. (G.O.Y.)

36091 SUPERDENSE HOLLOW-CATHODE GLOW DISCHARGE. Abramovich, L. Yu.; Klyarfel'd, B. N.; Nastich, Yu. N. (Lenin All-Union Electrotechnical Inst., Moscow). Zh. Tekh. Fiz., 36: 714-19(Apr. 1966). (In Russian).

During an investigation of hollow-cathode discharges in Ar, He, H_2, and Ne at pressures from 0.05 to 1 mm Hg, a previously unreported type of glow discharge was observed in which the cathode current density was as high as 50 amp/cm². The properties of these superdense discharges were investigated in detail. It was found that the cathode current density is limited by the appearance of cathode spots and transition to an arc discharge. (D.C.W.)

36092 VARIATION OF DIELECTRIC SURFACE PROPERTIES UNDER THE INFLUENCE OF GAS DISCHARGE. Dmitriev, A. V.; Tszyan, Tsze-tsyan' (Ul'yanov Electrotechnical Inst., Leningrad). Zh. Tekh. Fiz., 36: 739-45 (Apr. 1966). (In Russian).

The influence of a gas discharge on the surface resistance of dielectrics coated with polyethylene films 40 to 75 μ thick was investigated. It was established that the resistance decreased sharply under the influence of the gas discharge; this was explained by the appearance of a space charge in the boundary layer of the dielectric. The space charge consisted of electrons from the gas discharge. It was found that if the ionization processes are stopped, the surface resistance rises and approaches the initial value. A relation between the surface resistance and the peculiarity of spectral lines of the ionization current pulses was established. (ATD)

36093 IMPROVEMENTS IN SURGE TANKS, PRESSURE GENERATORS FOR A LIQUID OR PRESSURIZERS ADAPTED FOR PRESSURIZED LIQUID. (to Babcock and Wilcox Co.). French Patent 1,378,435. Oct. 5, 1964. Filed Dec. 12, 1963.

An insurge tank for use in a pressure system is adapted to contain a body of fluid maintained at a temperature different from that in the fluid system. The tank has a combined inlet and outlet line ending in the lower portion of the tank and in communication with the fluid system. A baffle is disposed in the tank and comprises plate means forming a tube-like member surrounding the end of the line and having one end ending between the end of the line and the tank. Means to dissipate the kinetic energy of the coming fluid are disposed within the tube-like member opposite the end of the line. (IIB)

Geophysics

Refer also to abstract 35985.

36094 (AD–635604) DIRECT IN SITU MEASUREMENTS OF AURORAL PARAMETERS. Scientific Report

No. 4. Baker, Kay D. (Utah Univ., Salt Lake City. Upper Air Research Lab.). May 6, 1966. Contract AF19(628)-4995. 199p. (AFCRL-66-413; UU-66-8). CFSTI $6.00 cy, $1.25 mn.

Three rockets were fired into visible auroral forms from Ft. Churchill, Manitoba, Canada, in the winters of 1964 and 1965. The rocket payloads contained a complex array of instruments in a program to simultaneously conduct direct in situ measurements of many important auroral parameters. The techniques and results of these measurements are presented followed by a discussion on the interrelationships between the atmospheric ionization, heating, excitation, and auroral light emission, resulting from the energetic electron flux interacting with the atmosphere. The instrumentation of these rocket payloads included electrostatic analyzers and a soft electron spectrometer for measurement of electron energy spectra from 40 to 60,000 ev; scintillators for auroral particle energy deposition (electrons E > 6 kev, protons E > 60 kev); Geiger counters for x rays and electrons (E > 40 kev); r-f impedance probes for electron density and temperature; retarding potential analyzers for electron and positive ion densities and temperatures; a mass spectrometer for positive ion composition; and photometers for auroral light measurements. In addition to the on-board rocket measurements, ground-based instruments provided correlating measurements; these instruments included all-sky cameras, photometers, spectrometers, magnetometers, riometers, and a vertical ionosonde. (M.O.W.)

36095 (CEA-R-2939) RAYONNEMENT GAMMA DANS L'ESPACE ET DANS L'ATMOSPHERE. (Gamma Radiation in Space and in the Atmosphere). Rocchia, Robert (Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires). 1966. 65p. Dep. mn.

Thesis. Submitted to Paris Univ., France.

It is shown that the γ radiation existing in the atmosphere is caused mainly by the bremsstrahlung of the electrons of the electromagnetic cascades (~50 per cent of the measured radiation), by the 511 kev radiation produced by the annihilation of positrons created in cascades (8 per cent of the measured intensity) and by the Compton γ degradation of this line (30 per cent of the measured intensity). The rest, slightly over 10 per cent, must be attributed to secondary causes such as the nuclear de-excitation γ to the internal bremsstrahlung of charged particles created in nuclear stars, and to charged particles crossing our detector, since the latter was not fitted with a device for rejecting these particles. Experiments carried out in rockets at Colomb-Béchar confirm these results and have made it possible to detect and measure a primary γ radiation having an intensity of $\sim 2\gamma\ cm^{-2}\ s^{-1}$ above 100 kev. The primary spectrum obeys an approximate E^{-2} law. (auth)

36096 (NASA-SP-3027) ELECTRON DENSITIES AND SCALE HEIGHTS IN THE TOPSIDE IONOSPHERE: ALOUETTE I OBSERVATIONS OVER THE AMERICAN CONTINENTS. VOLUME I: NOVEMBER 1962-JANUARY 1963. Chan, Kwok-Long; Colin, Lawrence; Thomas, John O. (National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center). 1966. 515p. CFSTI $5.50 cy, $2.25 mn.

Data are presented on electron density and plasma scale height at various heights and times in the topside ionosphere. (B.G.D.)

36097 (NBS-8815) SYMPOSIUM ON ULTRA LOW FREQUENCY ELECTROMAGNETIC FIELDS (FROM 30 c/s TO 0.001 c/s), AUGUST 17-20, 1964, BOULDER, COLORADO. (National Bureau of Standards, Boulder, Colo. Central Radio Propagation Lab. National Center for Atmospheric Research, Boulder, Colo.). 482p. (CONF-640815). NBS, Boulder, Colo.

Separate abstracts were prepared for 13 of the 36 included papers. Eighteen of the remaining were not in the scope of NSA. The remaining 5 papers appeared previously in NSA. For these abstracts see CONF-640815 in the report number index. (M.O.W.)

For abstracts of individual papers see: 36098-36106 and 36110-36113.

36098 (NBS-8815, pp 18.1-6) LONG-PERIOD GIANT PULSATIONS OF GEOMAGNETIC FIELD. Ohl, A. I. (Arkticheskii i Antarkticheskii Nauchno-Issledovantel'skii Institut, Leningrad (USSR)).

Investigations were made on regular sinusoidal oscillations of the geomagnetic field. Some of the properties of the oscillations are described. (M.O.W.)

36099 (NBS-8815, pp 19.1-3) A POSSIBLE SCHEME OF TRANSMISSION OF SOLAR CORPUSCULAR STREAM ENERGY WITH FORCE-FREE MAGNETIC FIELD TO THE MAGNETOSPHERE AND IONOSPHERE OF THE EARTH. Mogilevskii, E. I. (Akademiya Nauk SSSR, Moscow. (Institut Zemnogo Magnetizma, Ionosfery i Rasprostraneniya Radiovoln).

A solution of the question on excitation of oscillations and waves within a low frequency range in the magnetosphere requires an adoption of a definite scheme of energy transmission to the magnetosphere from a solar corpuscular stream. A possible method of solution is suggested. (M.O.W.)

36100 (NBS-8815, pp 20.1-3) A THEORY OF THE Dst MAIN PHASE AND CERTAIN ASSOCIATED PHENOMENA BASED ON GEOMAGNETIC FLUCTUATIONS. Cole, K. D. (Chicago Univ., Ill. Dept. of Geophysical Sciences).

A new theory is outlined which consistently relates geomagnetic fluctuations, the depletion of plasma in the outer magnetosphere during storms, the main phase of Dst, the occurrence and properties of the stable auroral red arc, and the "Dst variation" of the mid latitude F2 region. (M.O.W.)

36101 (NBS-8815, pp 27.1-19) TELLURIC CURRENT STUDIES OF AURORAL ZONE MICROPULSATION. Hessler, V. P. (Alaska Univ., College. Geophysical Inst.).

A review is presented of auroral zone micropulsation studies at Alaska University using the telluric current technique. (M.O.W.)

36102 (NBS-8815, pp 28.1-28) A REVIEW OF SEVEN STUDIES OF GEOMAGNETIC PULSATIONS ASSOCIATED WITH AURORAL ZONE DISTURBANCE PHENOMENA. Campbell, W. H. (National Bureau of Standards, Boulder, Colo. Central Radio Propagation Lab.).

A summary is given of seven studies of geomagnetic field pulsations in the frequency range of 2.0 c/s to 0.005 c/s which demonstrate a close relation to upper atmospheric auroral zone phenomena. The ultra low-frequency pulsations of irregular amplitude appearance are shown to be related to the disturbed ionosphere as evidenced by the auroral luminosity fluctuations, the electrojet behavior, the vertical incidence soundings of the E region, the cosmic noise absorption, high latitude infrasonic pressure waves, and balloon observations of electron bremsstrahlung. Simultaneous measurements at a number of world stations indicate the characteristic hemispherical behavior of the signals as well as the uniqueness of conjugate locations. (auth)

36103 (NBS-8815, pp 30.1-10) THE POLARIZATION OF GIANT PULSATIONS AT KIRUNA. Paulson, K. V.; Egeland, A. (Kungliga Vetenskapsakademien, Kiruna (Sweden). Geofysiska Observatoriet); Eleman, F. (Swedish Board of Shipping and Navigation, Stockholm).

The polarizations of four of the five giant pulsations recorded during 1963 at Kiruna (ϕ = 67.8°N, λ = 20.4°E) were analyzed by a method which was not used in previous geomagnetic investigations. This method of analysis gives a quantitative measure of the type and degree of polarization and the principal directions of the resultant vectors in each of three orthogonal planes. In addition, the phase differences between each of the three orthogonal components and the mean period of the quasi-periodic time variation in each component were derived. For these giant pulsations, attention is drawn to the variance of the vertical component which is of the same order and often larger than the variance of the corresponding geomagnetic north component. (auth)

36104 (NBS–8815, pp 32.1-13) ON THE LATITUDE DEPENDENCE OF PC-TYPE MICROPULSATIONS: RESULTS OF OBSERVATIONS ON A NORTH-SOUTH PROFILE THROUGH EUROPE. Voelker, Hans (Goettingen Univ. (West Germany). Geophysikalisches Institut).

A direct comparison of geomagnetic pulsations simultaneously recorded with standardized equipment at five observatories on a north-south profile through Europe gives as the most important finding a systematic increase of the periods of pc's and pse's with increasing geomagnetic latitude. A statistic analysis of the data shows one characteristic pc-period predominating at each of the German observatories Wingst, Göttingen, and Fürstenfeldbruck. For Enköping the spectrum of pc-periods contains two maxima near 75 sec and about 30 sec. Here the pulsations with the longer periods correspond to the pc's with latitude dependent periods at the German stations, while there are no corresponding effects at lower latitude for the maximum at shorter periods. At Kiruna the period-spectrum covers a wide range. Here also a peak appears near 30 sec as it was found for Enköping, but for longer periods the spectrum is nearly white. An explanation of these pulsations can be given in terms of field-aligned hydromagnetic oscillations in the magnetosphere under the additional assumption that the plasma density in the magnetosphere has a lamellar structure. The distribution of the pulsation periods, computed by Siebert, as a function of the geomagnetic latitude shows a good agreement with the observed data. (auth)

36105 (NBS–8815, pp 34.1-4) CONTINUOUS PULSATIONS OF THE EARTH'S ELECTROMAGNETIC FIELD AND DYNAMICS OF THE MAGNETOSPHERE. Bolshakova, O. V.; Troitskaya, V. A. (Akademiya Nauk SSSR, Moscow. Institut Zemnogo Magnetizma, Ionosfery i Rasprostraneniya Radiovoln).

The continuous pulsations of the earths' electromagnetic field are used to describe the dynamics of the magnetosphere. (M.O.W.)

36106 (NBS–8815, pp 35.1-23) ULTRALOW-FREQUENCY EFFECTS PROVOKED BY HIGH-ALTITUDE NUCLEAR EXPLOSIONS. Selzer, E. (Institut de Physique du Globe, Paris (France)).

A brief review is presented of the electromagnetic effects of 8 high altitude nuclear explosions. The basic data and experimental facts are reviewed. (M.O.W.)

36107 (NYO–1480-55) COASTAL REFRACTION OF VLF WAVES. Dobrott, D. R. (Courant Inst. of Mathematical Sciences, New York Univ., N. Y.). Apr. 15, 1966. Contract AT(30-1)-1480. 42p. (MF–51). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The fundamental solution for VLF waves propagating past a shoreline in the earth-ionosphere duct is obtained in terms of an infinite series using the Wiener-Hopf methods. The effects of the land, sea and ionosphere are given in terms of complex impedance boundary conditions. As a result, each mode in the series is progressively damped. At low frequencies and distances far from the shoreline where a single mode dominates, reflection and transmission coefficients are obtained. When the ionospheric impedance is small and when the source and receiver are sufficiently elevated, the effect of the shoreline is not observable. However, when either the source or receiver is near the earth the portion of the wave reflected is proportional to the difference of sea and land impedances. At slightly higher frequencies, there exists an annular region about the shoreline where two modes propagate over the sea while, due to heavy damping, only one mode propagates over the land. The resulting increase of the field strength as the receiver passes from land seaward is the "recovery effect." (auth)

36108 EFFECT OF COLLISIONS ON THE INCOHERENT DIFFUSION SPECTRA OF IONOSPHERIC PLASMA. Carru, Henri; Petit, Michel; Waldteufel, Philippe (Centre National d'Etude des Telecommunications, Issy-les-Moulineaux, France). Compt. Rend., Ser. B, 262: 1586-9(June 13, 1966). (In French).

The ionospheric diffusion probe has made it possible, by means of observations on the E shell, to show the modifications to the diffusion spectrum as a result of collisions between positive ions and neutral particles. (tr-auth)

36109 TRAPPED RADIATION MODEL ENVIRONMENTS. Vette, James I. Geophys. Space Data Bull., 2: No. 4, 207-315(1965).

Of the trapped radiation model environments presented there are four proton models covering different energy ranges above 4 Mev and an electron model covering the spatial region out to 6 earth radii. The data used to construct these models are given. Curves are also given showing various flux relations. (J.F.P.)

36110 REGULAR OSCILLATIONS NEAR 1 c/s OBSERVED AT MIDDLE AND LOW LATITUDES. Tepley, Lee (Lockheed Missiles and Space Co., Palo Alto, Calif.). J. Res. Nat. Bur. Stand., 69D: 1089-1105(Aug. 1965).

A review is presented of some of the more important properties of Pc 1 (0.2–5 c/s) emissions observed at middle and low latitudes. Special attention is given to fine structured regular oscillations referred to by various workers as pearls, type A oscillations, and hydromagnetic (hm) emissions. The following aspects of these oscillations are discussed: signal appearance, simultaniety of occurrence at widely separated locations, time of occurrence, and latitude effects. (M.O.W.)

36111 PRELIMINARY RESULTS OF A MICROPULSATION EXPERIMENT AT CONJUGATE POINTS. Gendrin, Roger E. (Groupe de Recherches Ionospheriques, Paris); Troitskaya, Valeria A. J. Res. Nat. Bur. Stand., 69D: 1107-16(Aug. 1965).

The preliminary results obtained by different scientists working at the two institutes on a common program concerned mainly with micropulsation studies between two conjugate areas at a geomagnetic latitude of 57° are summarized. Morphological studies and digital computations of correlation functions are made on the basis of the chart records obtained at the two stations. The signal being recorded independently on magnetic tape, spectral analyses are available also. (M.O.W.)

36112 SOME CHARACTERISTICS OF GEOMAGNETIC PULSATIONS AT FREQUENCIES NEAR 1 c/s. Campbell, Wallace H.; Stiltner, Ernest C. (National Bureau of Standards, Boulder, Colo.). J. Res. Nat. Bur. Stand., 69D: 1117-32(Aug. 1965).

Particular characteristics are described of unique natural electromagnetic field variations in the frequency range of 3.3 c/s to 0.15 c/s observed at the earth's surface. The signals usually exhibit a rising frequency fine structure but variations are observed. The midperiod and emission element recurrence period of an event are linearly related. The bursts of activity usually last about ½ hr, but a gross recurrent pattern may persist, on rare occasions, as long as 12 hr. Pulsations associated with field lines reaching the greater radial distances occur near the noon meridian; midfrequencies are lower at this time. Signals are generally not simultaneous at most high latitude stations in the same hemispheres, but the world level of high activity usually persist for several days. Although no seasonal or 27-day solar controlled periodicity was observed the emissions are more likely to occur during high solar activity and in the week following large major magnetic disturbances. No ionospheric effects associated with the field variations were clearly found. Although no great difference in the number of events was noticed for high and middle latitudes, there was a scarcity of such signals at the equator. Conjugate point stations show uniquely similar activity. There may be an alternation of the fine structure between stations in opposite hemispheres on the same earth's magnetic field line. In the high latitudes, the magnetic flux density vector of the emission appears to describe a plane perpendicular to the earth's field line, polarized in a counter clockwise sense, and elliptically elongated in the N–S direction. (auth)

36113 EFFECTS OF INDUCED EARTH CURRENTS ON LOW-FREQUENCY ELECTROMAGNETIC OSCILLATIONS. Price, A. T. (Univ., Exeter, Eng.). J. Res. Nat. Bur. Stand., 69D: 1161-8(Aug. 1965).

The information about the effects of induced earth currents that can be obtained from analyses of observations and from calculations based on electromagnetic induction theory is examined. The nature of these effects is discussed and estimates of their magnitude for fields of varying extent and frequency are obtained. The influence of underlying geology and the effects of the oceans are considered. The type of mathematical problem that needs to be solved to get more detailed information is described. (auth)

36114 LOW-FREQUENCY WAVES AND GRADIENT INSTABILITIES IN THE IONOSPHERE. Liu, C. H.; Yeh, K. C. (Univ. of Illinois, Urbana). Phys. Fluids, 9: 1407-16(July 1966).

Low-frequency incompressible waves in the inhomogeneous ionosphere are studied. It is proved that there exists a variational principle that allows the derivation of the dispersion relation by a simple trial solution technique. The dispersion relation shows that when the height gradient is positive and steep there may exist instabilities, and the growth rate is given approximately by $g\rho'/\rho\nu$, where g is the gravity, ρ the plasma mass density, ρ' its height gradient, and ν the ion-neutral collisional frequency. Experimental support of the gradient instability is given. (auth)

36115 INFLUENCE OF CORPUSCULAR RADIATION ON THE EVOLUTION OF THE HIBERNAL POLAR VORTEX. Vassy, A. (Faculte des Sciences, Paris). Planet. Space Sci., 14: 523-4(June 1966). (In French).

The total electron content of the ionosphere was measured daily with the S 66 satellite from October 10 to December 31, 1964. The results are graphed and show that the background of the polar vortex descends slowly but irregularly with a rest of the descent for periods of at least 3 days and 4 periods of ascent of the polar vortex background. It is suggested that the regularities of the hibernal movements of the polar vortex are related to the sporadic arrival of corpuscular radiation of solar origin. (J.S.R.)

36116 THEORETICAL PROTON VELOCITY DISTRIBUTIONS IN THE FLOW AROUND THE MAGNETOSPHERE. Spreiter, John R.; Alksne, Alberta Y.; Abraham-Shrauner, Barbara (Ames Research Center, Moffett Field, Calif.). 31p. (CONF-660401-3). ORAU. Gmelin, AED-CONF-66-061-8.

From American Meteorological Society, American Geophysical Union, Annual Joint Meeting, Washington, D. C.

Relations from kinetic theory are combined with results from fluid calculations to determine a microscopic interpretation of the properties of the solar wind as it flows around the magnetosphere. Proton velocity distributions are presented as a function of the particle speed and direction for several points in space for representative values of the solar wind parameters. The results illustrate how the velocity distribution is highly collimated in the incident stream, is completely isotropic at the magnetosphere nose, and changes back to that of a highly collimated stream along the flanks of the magnetosphere. Except for a very small region in the vicinity of the magnetosphere nose, the number of particles that move in the upstream direction is insignificantly small compared with the number that move in the direction of the bulk velocity. The most probable speed of the protons, as viewed in a frame fixed in the earth, is always in the direction of the local bulk velocity, and tends to be relatively constant throughout the flow in spite of substantial changes in temperature and bulk velocity. A discussion is presented on the relation of these results to the measurements that would be made by various types of instruments commonly used to observe plasma flows in space. (auth)

Gravitation, Quantum Mechanics, and Relativity Theory

36117 (ITEF-394) O NEOTRITSATEL'NOSTI POLYARIZATSIONNOI MATRITSY PLOTNOSTI. (Non-Negativity of a Polarization Matrix of Density). Marinov, M. S. (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow. Institut Teoreticheskoi i Eksperimental'noi Fiziki). 1965. 8p. Dep. mn.

The condition on a density matrix ρ to have no negative eigenvalues is given in terms of the invariants Sp ρ^k. ($k \leq n$; n is the order of $\rho = 2j + 1$ for spin j.) Thus, besides the well known inequality Sp $\rho^2 \leq 1$, there are still $(2j - 1)$ inequalities. Sp ρ^k is a polynomial of polarization moments, coefficients being some combinations of Clebsch- and Racah-symbols. As a result, one has $2j$ inequalities satisfied by polarization moments. (auth)

36118 RADICAL COMPONENTS OF WAVES AND PARTICLE TRAJECTORIES IN NONLINEAR ELECTRODYNAMICS. Boillat, Guy. Compt. Rend., Ser. A, 262: 1364-7 (June 13, 1966). (In French).

It appears that the radial components of the electrodynamic waves can represent particle trajectories; these are geodesics of zero length of a certain Riemann space. The value of the intensity of the internal electric field of these particles is given. (tr-auth)

36119 RELATIVISTIC KINEMATICS. Arzelies, Henri. New York, Pergamon Press, 1966. 306p. $12.00.

Translation based on 1955 French version of Cinematique Relativiste.

Topics considered include the measurement of lengths, time intervals, the reference system, and physical theories. Also Lorentz-Einstein transformation, transformation of lengths, time intervals, velocities, and accelerations, starting and stopping problems, the Thomas effect, the clock paradox, rotating disc, and Minkowski continuum are discussed. (J.F.P.)

Low Temperature Physics

Refer also to abstract 35913.

36120 (LA-DC-7793) He II PERSISTENT CURRENT GYRO ELEMENT FOR INERTIAL NAVIGATION. Sikora, P. T.; Hammel, E. F.; Keller, W. E. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [1965]. Contract W-7405-eng-36. 10p. (CONF-660628-2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Inst. of Refrigeration Commission I Meeting, Boulder, Colo.

In order to construct a usable inertial navigation system for space travel, it is imperative to have a gyro element with an extremely small drift rate. The advantages of a Helium II superfluid gyroscope are discussed. (M.O.W.)

36121 (LA-DC-7794) LIQUID HELIUM TECHNOLOGY IN NUCLEAR POLARIZATION EXPERIMENTS. Roberts, T. R. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [1966]. Contract W-7405-eng-36. 10p. (CONF-660628-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Inst. of Refrigeration Commission I Meeting, Boulder, Colo.

Cryogenic design problems encountered to date in experiments with polarized proton targets performed with various incoming beams are summarized. Future improvements which may result from current experiments with polarized proton spin refrigerators are also indicated. (M.O.W.)

36122 (LA-DC-7801) CRITICAL NUCLEATE BOILING OF LIQUID HELIUM IN A SIMULATED WIRE-WOUND MAGNET. Sydoriak, S. G.; Roberts, T. R. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [1966].

Contract W-7405-eng-36. 8p. (CONF-660628-3). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Inst. of Refrigeration Commission I Meeting, Boulder, Colo.

The applicability of the equation $Q = A_x L \sqrt{\rho_V \rho_L f Z g}$, which is a theoretical relation for the total heat transfer of boiling heat transfer in narrow channels and where A_x is the horizontal cross section of the channels (not the heated area), L the heat of vaporization, ρ_V and ρ_L the vapor and liquid densities, f the quality or mass fraction of vapor in the fluid leaving the top of the channel, g the gravitational acceleration and Z the height of the channel if immersed in a bath or the hydrostatic head equivalent to a driving pressure in the case of forced flow in a heated channel, to the problem of stabilization of superconducting magnets by incorporation of channels for flow of liquid helium is discussed. (B.G.D.)

36123 (LA-DC-7806(Rev.)) PRESSURE OSCILLATIONS INDUCED BY FORCED-CONVECTION HEATING OF DENSE HYDROGEN. Paper H-4. Thurston, R. S.; Rogers, J. D. (Los Alamos Scientific Lab., Univ. of California, N. Mex.); Skoglund, V. J. (New Mexico Univ., Albuquerque). [1966]. Contract W-7405-eng-36. 28p. (CONF-660605-4). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Cryogenic Engineering Conference, Boulder, Colo.

Among the pressure oscillations induced by forced convection heating of dense hydrogen and reported in an earlier publication were thermal-acoustic modes with frequencies that were approximately equal to acoustic frequencies. Thermal-acoustic oscillations are investigated. New data on conditions for the inception of oscillations, their frequencies, and their pressure amplitudes were correlated by the use of similarity numbers. Although the correlation of inception conditions was based on data of hydrogen in a straight 1/4 in. tube, it also represented the data of Platt and Wood for liquid oxygen in 3/4 in. coils. At low subcritical pressures the correlations use two-phase properties. Near and above the critical pressure the correlations employ quasi two-phase properties, which were derived from changes in fluid properties which occur in crossing either the vapor pressure line at subcritical pressures or the locus of specific heat maxima at supercritical pressures. The fluctuations of fluid temperature and flow rate during thermal-acoustic oscillations are presented. (auth)

36124 (RHEL-R-118) ESTIMATES OF RADIATION DOSE RATES FOR SUPERCONDUCTING MAGNETS. Lewin, J. D. (Rutherford High Energy Lab., Science Research Council, Chilton (England)). Feb. 1966. 17p. Dep. mn. BIS $0.50. HMSO 2s. 6d.

The possible effects of irradiation on superconducting magnets are listed, and the radiation doses magnets may be subjected to in high energy physics applications are estimated, as a guide to the experiments which will be necessary to determine the suitability of superconductors to these applications. The heating of a superconducting magnet by radiation is calculated, and the limitations imposed by the resulting increase in superconductor temperature are discussed. The results are summarized in a form which should prove generally useful in the estimating of approximate radiation levels in the vicinity of particle accelerators. While these results apply to proton machines only, it seems that values for electron machines should not be substantially different. (auth)

36125 (SLAC-PUB-182) A HIGH-FIELD 1.3m SUPERCONDUCTING SPLIT COIL MAGNET WITH FORCED LIQUID HELIUM COOLING. Brechna, H. (Stanford Linear Accelerator Center, Stanford Univ., Calif.). Apr. 1966. Contract AT(04-3)-400. 36p. (CONF-660544-1). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From Swiss Electrical Engineering Society, Superconductivity Conference, Zurich.

Experiments are described with various superconducting type II cables and hollow conductor configurations, current distribution, size effect in superconductor and performance of multistranded superconducting stabilized cables and magnets. A 30 cm bore 70 kG split coil magnet with a total field energy of about 6×10^6 joules is presented and a new superconducting coil configuration with forced liquid helium cooling introduced, which will produce about 55 kG in the center of the SLAC 1m liquid helium bubble chamber. (auth)

36126 HYSTERETIC PHENOMENA IN TYPE II SUPERCONDUCTORS. LeBlanc, M. A. R.; Griffiths, D. J. (Univ. of Southern California, Los Angeles). Appl. Phys. Lett., 9: 131-4(Aug. 1, 1966).

An investigation was made on type II superconductors to exhibit an impressively persistent memory of initial conditions and display markedly different hysteretic behavior at low decreasing fields depending on the magnetic field present when the superconducting state is established. Two procedures were used to show the flux trapping in superconductors: (1) the sample is allowed to cool through T_c to a final temperature T_f in the presence of a magnetic field H which is then removed and (2) the sample is allowed to cool through T_c to T_f in zero field and is then subjected to a magnetic field which is subsequently withdrawn. Several diagrams showing this residual magnetization are presented. (M.O.W.)

36127 ANOMALOUS SUPERCONDUCTING SURFACE NUCLEATION FIELDS. Doidge, P. R. (Battersea Coll. of Tech., London); Kwan, Sik-Hung; Tilley, D. R. Phil. Mag., 13: 795-803(Apr. 1966).

Complex a-c incremental permeability measurements were made on In–Tl alloys to investigate the dependence of the superconducting surface nucleation field H_{c3} on surface treatment. Freshly electropolished or etched surfaces of high Tl content alloys had anomalously high H_{c3}/H_{c2} values which were restored towards the Saint-James–de Gennes value of 1.7 on annealing. For the anomalous surfaces the ratio H_{c3}/H_{c2} was found to be temperature dependent. It is suggested that anomalous behavior is due to increased scattering of normal electrons near the surface caused by preferential solution of In during electropolishing or etching. It is shown that the general features of anomalous behavior can be accounted for theoretically; this is done by modifying, to first-order perturbation, the surface nucleation condition derived from the Gor'kov linear equation for the energy gap function assuming an extra attractive non-local surface scattering potential. (auth)

36128 PROXIMITY EFFECT IN THE LEAD–COPPER SYSTEM BY ELECTRON TUNNELLING. Adkins, C. J.; Kington, B. W. (Cambridge Univ., Eng.). Phil. Mag., 13: 971-87(May 1966).

The electronic structure resulting from the proximity effect was investigated by electron tunneling techniques. A well-defined gap-like structure is found at the surface of copper films deposited on lead. The observed "energy gap" decreases with increasing copper thickness as does the deviation in the density of states. The form of the tunneling characteristics shows that in the developed superconducting state there is a localization of the states lying just above the gap in the copper. The states within the gap were not found as predicted by De Gennes and Saint-James. By tunneling into both sides of sandwiches of thin superimposed films of copper and lead the interaction parameter in copper, N(0)V, is estimated to lie between +0.06 and −0.10, indicating that if copper becomes superconducting it has a transition temperature below 20 μ°K. (auth)

36129 ORDER-DISORDER THEORY FOR LIQUID ^{3}He–^{4}He MIXTURES. Sreedhar, A. K. (Solidstate Physics Lab., Delhi). Phys. Fluids, 9: 1359-61(July 1966).

Assuming that the lambda transition in liquid ^{4}He and in ^{3}He–^{4}He solutions can be described formally on the basis of an order-disorder theory, the thermodynamic behavior of ^{3}He–^{4}He solutions was analyzed using Bragg-Williams approximation. It is found that the order-disorder formalism accounts for the observed behavior fairly well, especially at low ^{3}He concentrations. (auth)

36130 ELECTRON-TUNNELING MEASUREMENT OF A SMALL ENERGY GAP IN LANTHANUM. Edelstein, A. S.; Toxen, A. M. (IBM Watson Research Center, Yorktown Heights, N. Y.). Phys. Rev. Lett., 17: 196-8 (July 25, 1966).

The first electron tunneling measurements of an energy gap in lanthanum are reported. The measured value for $2\Delta_0/kT_c$ of 1.65 ± 0.15 is considerably lower than the value predicted by the BCS theory, 3.52. At voltages above that at which the gap is observed, an increase in conductance is also observed. This might be due to the f-band quasiparticle excitations predicted by another model. (M.H.R.)

36131 SUPERCONDUCTING LANTHANUM CHALCOGENIDES. Bozorth, R. M.; Holtzberg, F.; Methfessel, S. (IBM Watson Research Center, Yorktown Heights, N. Y.). pp 19-30 of Solid State Session P-2. Book Four [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

The lanthanum chalcogenides LaSe, LaS, La_3Se_4, and La_3S_4 were investigated for superconductivity above 1.3°K by magnetic susceptibility measurements. The following transition temperatures T_c were derived from the temperature dependence of the frozen-in magnetic flux, La_3S_4: 6.5°K, La_3Se_4: 8.6°K. La_3Te_4, LaS, and LaSe are not superconducting above 1.3°K. The 3:4 compounds have a wide homogeneity range with the Th_3P_4 structure and the electrical properties vary with decreasing La concentration from metallic to semiconducting without change of lattice constant. The superconducting transition temperature in La_3Se_4 decreases initially by about 5°K for each at. % decrease in La. (auth)

36132 VORTEX RING FORMATION IN SUPERFLUID HELIUM. Pollock, Franklin (Stevens Inst. of Tech., Hoboken, N. J.). Trans. N. Y. Acad. Sci., Ser. II, 28: 512-16(Feb. 1966).

The theory for vortex ring formation in superfluid helium is summarized, and experimental evidence for the existence of pure potential flow in liquid helium is briefly examined. It is concluded that the formation of the vortex rings can be understood on the basis of quantum ideas directly. (J.F.P.)

36133 NUCLEATION OF SUPERCONDUCTIVITY IN WEDGE GEOMETRY. Houghton, A.; McLean, F. B. (Brown Univ., Providence). 10p. (CONF-651015-12). ORAU, Gmelin, AED-CONF-65-312-31.

From American Physical Society Meeting, Chicago.

A study was made of the nucleation region for samples having infinite wedge geometry with angular widths up to 90°. It is shown that superconducting regions first appear near the point of the wedge, and the approximate equation of the nucleation field for a plane boundary is found. The result leads to the conclusion that it should be possible to measure the Landau-Ginzburg parameter for a wide range of materials from a determination of the nucleation field for a plane boundary. (J.F.P.)

Neutron Physics

See also REACTOR TECHNOLOGY — Criticality Studies

Refer also to abstract 35975.

36134 (AAEC-E-149) RESPONSE MATRICES IN THE DOUBLE P_N APPROXIMATION OF NEUTRON TRANSPORT THEORY. Thompson, J. J. (Australian Atomic Energy Commission Research Establishment, Lucas Heights). Feb. 1966. 12p. Dep. mn.

Relations are derived for reflection and transmission matrices of slabs in the double P_N approximation which permit their evaluation without the determination of particular eigenvalues and eigenvectors for each problem. Invariance principles also lead to results analogous to those of Chandrasekhar in his classical theory of radiative transfer. (auth)

36135 (AAEC-TM-310) SCATLD: A TAPE EDITING PROGRAMME FOR GYMEA NEUTRON SCATTERING LIBRARIES. McGregor, B. (Australian Atomic Energy Commission Research Establishment, Lucas Heights). Jan. 1966. 42p. Dep. mn.

SCATLD is a tape editing program used to load GYMEA neutron scattering libraries from cards, or from cards and another library. Whole libraries or selected sections can be printed or punched. (auth)

36136 (AE-227) INTEGRAL TRANSPORT THEORY IN ONE-DIMENSIONAL GEOMETRIES. Carlvik, Ingvar (Aktiebolaget Atomenergi, Stockholm (Sweden)). June 1966. 65p. Dep. mn.

A method called DIT (Discrete Integral Transport) was developed for the numerical solution of the transport equation in one-dimensional systems. The characteristic features of the method are Gaussian integration over the coordinate as described by Kobayashi and Nishihara, and a particular scheme for the calculation of matrix elements in annular and spherical geometry that has been used for collision probabilities in earlier Flurig programs. A general theory including such things as anisotropic scattering and multi-pole fluxes, and a brief description of the Flurig scheme are presented. Annular geometry is treated in some detail, and corresponding formulae are given for spherical and plane geometry. There are many similarities between DIT and the method of collision probabilities. DIT is in many cases faster, because for a certain accuracy in the fluxes DIT often needs fewer space points than the method of collision probabilities need regions. (B.G.D.)

36137 (AEEW-M-621) A DESCRIPTION OF THE ELAN COMPUTER CODE. Maunders, E. J. (Atomic Energy Establishment, Winfrith (England)). Mar. 1966. 20p. Dep. BIS $0.60, HMSO 3s.

The ELAN code was developed for use in the field of integral neutron energy spectrum measurements. Two problems are dealt with, that of effective filter cut-off energies, and filtered detector reaction rates, and the problem of self-shielding in detectors. In the latter case routines are included which aid the design of sandwich foil packs which make use of self-shielding. (auth)

36138 (AWRE-O-3/66) SWANTIME: A TIME-DEPENDENT MULTI-GROUP DIFFUSION CODE FOR THE IBM-7030. Brickstock, A.; Davies, A. R.; Smith, I. C. (Atomic Weapons Research Establishment, Aldermaston (England)). May 1966. 41p. Dep. mn. BIS $1.20, HMSO 6s. 0d.

SWANTIME is a code for solving the time-dependent multigroup diffusion equations in one dimension. Spherical geometry only is allowed. It is intended primarily to follow the response to a neutron pulse injected into a system with short prompt neutron lifetime. Delayed neutron effects are not included. (M.O.W.)

36139 (GA-7055) NEUTRON SCATTERING BY HYDROGENEOUS MODERATORS. Koppel, J. U. (General Dynamics Corp., San Diego, Calif. General Atomic Div.). Mar. 22, 1966. Contract AT(04-3)-167. 76p. (CONF-660204-16). Dep. mn. CFSTI $3.00 cy, $0.75 mn.

From American Nuclear Society Meeting, San Diego, Calif.

An analysis is presented on the state-of-the-art of calculating slow neutron scattering from liquid hydrogen, polyethylene, water, and zirconium hydrides, and comparisons are made between theoretical results and recent experiments. (B.G.D.)

36140 (GA-7091) INTEGRAL NEUTRON THERMALIZATION. Quarterly Progress Report for the Period Ending March 31, 1966. Antunez, H.; Beyster, J. R.; Brouwer, W.; (and others) (General Dynamics Corp., San Diego, Calif. General Atomic Div.). Apr. 22, 1966. Contract AT(04-3)-167. 208p. Dep. mn. CFSTI $6.00 cy, $1.25 mn.

A progress report is presented on integral neutron thermalization, which includes theoretical studies, exper-

imental and analytical studies, and experimental and calculational techniques. (B.G.D.)

36141 (IEA–107) ESTUDO PRELIMINAR DOS PARAMETROS DE DIFUSAO DA AGUA PARA NEUTRONS TERMICOS PELO METODO DA FONTE PULSADA. (Preliminary Studies of Diffusion Parameters in Water for Thermal Neutrons by Means of the Pulsed Source Method). de Carvalho, Myrian; Paiano Sobrinho, Silvestre (Instituto de Energia Atomica, Sao Paulo (Brazil)). Nov. 1965. 17p. (CONF-631104–10). Dep. mn.

From Meeting on the Utilization of Research Reactors, Sao Paulo, Brazil.

The thermal neutron diffusion parameters of water were measured at room temperature (20°) by the pulsed neutron source method. Geometrical bucklings varying from 0.078 to 0.201 cm^{-2} were considered. The decay curves and the straight line λ (B^2) were fitted by a least squares method giving $\bar{v}\,\Sigma_a = (4947 \pm 208)$ sec^{-1} and $D = (3327 \pm 1647)$ cm^2/sec. The experimental arrangement is described. The experiment permitted a quite complete survey of the problems connected to the measurement technique as well as to the methods of data analysis. (auth)

36142 (NASA-TM–X-1260) PROGRAM FOR CALCULATION OF NEUTRON AGES FROM EXPERIMENTAL ACTIVATION DATA. Semler, Thor T. (National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center). July 1966. 32p. CFSTI $2.00 cy, $0.50 mn.

A program for the computation of neutron ages from experimental activation data is described. The quadrature schemes and error analyses are detailed along with some curve-fitting techniques. A "best-fit" derived from statistical decision theory is described. (auth)

36143 (WAPD-T–1885) A VARIATIONAL PRINCIPLE FOR THE NEUTRON DIFFUSION EQUATION USING DISCONTINUOUS TRIAL FUNCTIONS. Buslik, A. J. (Bettis Atomic Power Lab., Pittsburgh, Pa.). Dec. 1965. Contract AT-11-1-GEN-14. 14p. (CONF-660606–13). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From American Nuclear Society Meeting, Denver.

Selengut and Wachspress have developed a variational principle for the neutron diffusion equation which permits the use of discontinuous trial functions. Another variational principle is described which is useful with a wider class of trial functions. (M.O.W.)

36144 (ZFK-RN–33) ABSOLUTEICHUNG VON NEUTRONENQUELLEN NACH DEM MANGANSULFATVERFAHREN. (Absolute Calibration of Neutron Sources by the Manganese Sulfate Method). Faehrmann, Karl-Heinz (Zentralinstitut fuer Kernforschung, Rossendorf bein Dresden (East Germany)). Feb. 1966. 17p. Dep. mn.

After a brief discussion of the principles of the method the special chosen measuring assembly and the method of detector calibration by means of $4\pi\beta$ measurements are described. The method which is checked by the calibration of a standard-source allows the calibration of neutron sources with an accuracy of $\leq 2\%$. The smallest measurable source strength is about 1.10^4n/sec. (auth)

36145 NUCLEAR REACTORS AS SOURCES OF NEUTRONS. Wainerdi, R. E. (Texas A and M Univ., College Station). pp 47-50 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

Nuclear reactors as a source for neutrons are considered. It is difficult to use reactor-produced neutrons for activation analysis unless the neutrons are thermalized, which gives less yield than a large accelerator. Neutron economy in chain reactions is discussed. (P.C.S.)

36146 VAN DE GRAAFF GENERATORS AS NEUTRON SOURCES. Bygrave, W. (High Voltage Servicing Co. Ltd., Eastcote, Eng.). pp 57-60 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

The principles of operation of the Van de Graaff generator as a neutron source are reviewed. Reactions and target materials important for neutron production are discussed. (P.C.S.)

36147 OPERATIONAL CHARACTERISTICS OF A RF ION-SOURCE FOR PULSED NEUTRON SOURCE. Miyake, Hiroshi (Kobe Univ. of Mercantile Marine, Japan); Watanabe, Masanori. Kobe Shosen Daigaku Kiyo. Dai-2-Rui. Kokai, Kikan, Rigaku-hen, No. 13, 119-23 (Mar. 1966). (In Japanese).

Operational characteristics of r-f ion sources for pulsed neutron sources were investigated. The shape of the ion sheath around the canal was the severest factor for the ion source efficiency. The optimal depth of the quartz sleeve on the canal was equal to the inner diameter of the canal. Probe current had a peak at the low probe voltage (about 1 kv). Ion beam current was saturated at the probe voltage several hundred volts higher than the value at the point of the minimum probe current. At the pulse operation a peak appeared in the signal of ion beam current. The ratio of peak current to steady current could be used as an index of focusing. (auth)

36148 STUDY OF D_2O ICE AS A COLD-NEUTRON SOURCE. Rush, J. J.; Connor, D. W.; Carter, R. S. Nucl. Sci. Eng., 25: 383-9(1966).

The leakage flux from an 18 × 18 in. cylinder of D_2O with a beam of pile neutrons incident at its center was studied at D_2O temperatures from 22° to 293°K. Intensities through beryllium and graphite filters, as well as indium foil transmissions, were measured to determine cold-neutron fractions and neutron temperatures for the emerging spectra. The results of these measurements show that large volumes of D_2O ice can be useful as low-temperature moderators in reactors. The percentage of leakage neutrons with $\lambda_n \geq 3.95$ Å is 21% at 22°K, a 20-fold increase over the fraction at 293°K, and about twice the value at 100°K. The neutron temperature of the leakage spectrum, calculated from the transmission data assuming a Maxwellian distribution, decreases with moderator temperature, reaching a value of about 75° for D_2O at 22°K. An abrupt increase in the fraction of cold neutrons is observed at the D_2O freezing point, which appears to reflect a change in the transport rather than the moderating properties of the D_2O, due to a decrease in the cross section for long-wavelength neutrons. (auth)

36149 ANALYTIC ERROR ESTIMATES FOR INTEGRAL-EQUATION EIGENVALUE PROBLEMS IN NEUTRON PHYSICS. Sargis, David A.; Grossman, Lawrence M. Nucl. Sci. Eng., 25: 395-406(1966).

The technique usually employed to estimate errors in approximation schemes for neutron physics problems is simply to compare the results with higher order approximations or purely numerical results, or with available experimental measurements. An analytic error-estimating technique is developed for deriving error bounds for approximate eigenvalues, which depends only on the proximity of the exact and approximate eigenvalues and not on higher order approximations. An integral equation formulation is employed in developing the error estimating method, but the form of the integral equation kernel is not restricted, so that broad classes of integral equations may be treated. By means of the Green's function, differential-equation eigenvalue problems may also be handled. To illustrate the error estimating method, the space decay constant eigenvalue problem of neutron thermalization theory is discussed. Error bounds are developed for the space decay constant eigenvalues in both the Wilkins heavy-gas differential equation and Wigner-Wilkins integral-equation scattering models. The results obtained indicate that rigorous error estimates can be obtained with little computational effort. (auth)

36150 DISPERSION OF THERMAL-NEUTRON PULSES IN NEUTRONIC SYSTEMS. Moore, M. N. Nucl. Sci. Eng., 25: 422-6(1966).

The propagation of a thermal-neutron pulse through homogeneous neutronic systems, multiplying or nonmultiplying, is studied with the aid of the general linear model. This model is characterized by a complex dispersion law that

governs the neutron-wave optics of the system. The dispersion of the pulse, which may be regarded as a superposition of a continuous spectrum of monochromatic waves, is also governed by the system dispersion law. It is shown that Fourier transformed moments of the pulse, evaluated at a sequence of detector positions within the system, yield derivatives of the dispersion law. The order of the derivative is just the order of the moment. In zero'th order, one reverts to the conventional neutron-wave experiment. Using this method of analysis, a thermal-pulse experiment, in principle, can be made to yield more information than can a wave experiment and could serve as the basis of an on-line monitor of power reactor stability. (auth)

36151 DECAY CONSTANT OF A NEUTRON PULSE. Corngold, Noel; Durgun, Kanat (Brookhaven National Lab., Upton, N. Y.). Nucl. Sci. Eng., 25: 450-1(1966).

The time-dependent activation of a 1/v detector located in the moderating sample was computed using the simplified Boltzmann equation. The results which are given indicate how decay constants might be observed over an unexpectedly large range of bucklings in crystalline moderators. (J.F.P.)

36152 RADIATIVE HEAT EMISSION IN MATERIALS PRODUCING COLD NEUTRONS. Krasin, A. K.; Naumov, V. A.; Nikolaeva, G. K. Vestsi Akad. Navuk BSSR, Ser. Fiz. Tekh. Navuk, No. 4, 16-24(1965). (In Russian).

Cold neutrons having an energy of 0.005 ev can be obtained by using a suitable moderator. Formulas are presented to calculate the gamma heating in the moderator, and the heating due to the slowdown of fast neutrons. The gamma heating in LiH, ZrH_2, Be, He, CH_4, CH_2, and C is calculated at 22, 29, 34.5, 54.5, 74.5 and 94.5 cm from the reactor core. The heat evolved in the above materials due to the slowdown of fast neutrons is also calculated. The total heat evolved in moderator inserts of LiH and Be with radii of 5 and 7 cm respectively is calculated at various distances from the reactor core. The liquid helium requirements to cool the moderator inserts are tabulated. (TTT)

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Refer also to abstracts 36001 and 36003.

36153 (AD-635252) ENERGY LEVELS OF ^{127}I. Hurley, J. P.; Mathiesen, J. M. (Naval Radiological Defense Lab., San Francisco, Calif.). May 10, 1966. 35p. (USNRDL-TR-1019). CFSTI $2.00 cy, 0.50 mn.

Gamma-ray singles and coincident measurements were made on the radiations from the ^{127m}Te, ^{127}Te–^{127}I decay sequence. Gamma-ray intensities were measured, log ft values were computed, and spin-parity assignments were made to the energy levels of ^{127}I. A decay scheme is proposed on the basis of previous and present data. (auth)

36154 (AD-635312) SINGLE LEVEL MUON CAPTURE CALCULATIONS FOR ^{12}C AND ^{16}O. Jacob, R. F.; Huffaker, J. N. (Alabama Univ., University). May 1966. 83p. (AROD-4819:1). CFSTI $3.00 cy, $0.75 mn.

Assuming the validity of the Universal Fermi Interaction hypothesis, comparison of theoretical single level muon capture rates with experimental data may prove valuable in determining the form and extent of renormalization of the nucleon-lepton weak interaction Hamiltonian density (the magnitudes of the induced form factors). The muon capture transition probabilities for the $^{12}O \rightarrow {}^{12}B$ (ground state to ground state) and the $^{16}O \rightarrow {}^{16}N$ ($0^+ \rightarrow 0^-$), ($0^+ \rightarrow 1^-$) transitions are calculated. Analysis of experimental results for these rates allows computation of a region of possible values for the induced pseudoscalar (g_p) and induced tensor (g_T) form factors. Results are qualitatively in agreement with theoretical predictions of $g_p = 8\lambda$, where $g_T = 0$. The muon wave functions are corrected for finite nuclear size and relativistic effects, which are found to be not entirely negligible, even for the ratio of ^{16}O capture rates. (auth)

36155 (COO-1420-124) RESEARCH IN NUCLEAR PHYSICS. Progress Report No. 16. (Purdue Research Foundation, Lafayette, Ind.). June 15, 1966. Contract AT(11-1)-1420. 56p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

Brief summaries of research on various nuclear reactions are presented. Results of an investigation on isobaric spin conservation in the reaction ^{40}Ca(d,α)^{38}K are presented. The fabrication and use of Ge(Li) detectors for gamma-gamma angular correlation measurements are described. (M.O.W.)

36156 (COO-1573-1) ELECTROMAGNETIC SCATTERING OF CHARGED PARTICLES WITH SPIN. Holdeman, Jonas T. Jr. (Case Inst. of Tech., Cleveland, Ohio). June 1966. Contracts AT(11-1)-720; AT(11-1)-1573. 121p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Thesis.

The effect of the anomalous magnetic moment of charged particles in electromagnetic scattering is studied. The coulomb interaction is treated exactly, while the phase shift due to the interaction of the magnetic moment with the coulomb field is treated in the distorted wave Born approximation. These phase shifts are found from the Schrödinger equation with relativistic corrections and from the Dirac equation with a Pauli moment interaction. The expressions for the two scattering amplitudes in terms of the phase shifts are examined. For several cases these amplitudes are calculated numerically, along with the electromagnetic polarization. The results are compared with other approximations. (auth)

36157 (CU-1019-51) PROGRESS REPORT [ON PARTICLE PHYSICS]. Miller, J. M. (Columbia Univ., New York). June 1966. Contract AT(30-1)-1019. 10p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Brief descriptions of research carried out during this period are presented for the following: Monte Carlo calculations of intra-nuclear cascades, investigation of Bohr's independence hypothesis by measurements of particle spectra, reaction cross section of an excited nucleus, excitation function for the ^{62}Ni(p,n)^{62}Cu reaction, computer program for conservation of angular momentum in compound-nucleus reactions, the ^{4}He(p,2p)^{3}H reaction at high energies, and decay schemes of ^{201}Bi, ^{202}Bi, ^{203}Bi, and ^{204}Bi. (M.O.W.)

36158 (EANDC-55(U)) COMPILATION OF EANDC REQUESTS. (European-American Nuclear Data Committee). Mar. 1966. 56p. Dep. mn.

This compilation of requests was prepared on the basis of the following sources: current nuclear data requirements for the United Kingdom reactor program, compilation of request for nuclear cross section measurements, compilation of requests for neutron data from EURATOM countries, nuclear data requirements in Sweden and Switzerland, and the Canadian list of requests for measurement. (M.O.W.)

36159 (GA-6997) NEUTRON CROSS SECTIONS FOR CADMIUM ISOTOPES. Drake, M. K. (General Dynamics Corp., San Diego, Calif. General Atomic Div.). Mar. 25, 1966. Contract SNPC-27. 61p. (NASA-CR-54933).

A survey was made of the available information on neutron cross section measurements of cadmium and its isotopes. Sets of neutron cross sections were prepared for the element cadmium and the isotopes ^{110}Cd, ^{111}Cd, ^{112}Cd, ^{113}Cd, ^{114}Cd, and ^{115}Cd from literature available to November 1965. (B.G.D.)

36160 (GA-7060) ACCURACY OF RESONANCE PARAMETERS FROM COMBINED AREA AND SELF-INDICATION MEASUREMENTS. Froehner, F. H.; Haddad, E.; Lopez, W. M.; Friesenhahn, S. J. (General Dynamics Corp., San Diego, Calif. General Atomic Div.). Apr. 27, 1966. Contract AT(04-3)-167. 15p. (CONF-660303-43). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From American Physical Society, Conference on Neutron Cross Section Technology, Washington, D. C.

The information which can be obtained from measured

transmission areas, capture areas, scattering areas, and self-indication ratios is studied by means of the analysis curves (Γ_n versus Γ_γ). It is shown that the character of the curve intersections, and thus the accuracy of the calculated resonance parameters, depends mainly on the strength of the resonance ($\Gamma_n : \Gamma$). Universal analysis curves are plotted for thin and thick samples, and for strong, intermediate, and weak resonances. The curves readily indicate which observables should be used, and roughly what accuracies may be expected for the various cases. (auth)

36161 (IC–66/62) EIGENFUNCTION EXPANSIONS ASSOCIATED WITH THE SECOND-ORDER INVARIANT OPERATOR ON HYPERBOLOIDS AND CONES. Limic, N.; Niederle, J.; Raczka, R. (International Centre for Theoretical Physics, Trieste (Italy)). June 1966. 38p. Dep. mn.

The eigenfunction expansions associated with the second order invariant operator on hyperboloids and cones are derived. The global unitary irreducible representations of the SO_0 (p,q) groups related to hyperboloids and cones are obtained. The decomposition of the quasiregular representations into the irreducible ones is given and the connection with the Mautner theorem and nuclear spectral theory is discussed. (auth)

36162 (IEA–106) MINIMOS QUADRADOS PARA COMBINACAO LINEAR DE EXPONENCIALS. (Least Squares Method Using a Linear Combination of Exponentials). de Carvalho Paiano, Myrian; Cohenca, J. Max (Instituto de Energia Atomica, Sao Paulo (Brazil)). Nov. 1965. 15p. Dep. mn.

The least squares method using a linear combination of exponentials has been often used in analysis of decay curves coming from pulsed neutron experiments. The decay curves are fitted by a linear combination of exponentials plus a constant background. The method may be used to study the decay of any mixture of radioactive isotopes, with the following restrictions; the maximum number of experimental points is 200; the maximum number of exponentials is 10; and the points are equally spaced on the time axis, which is considered free of errors. The least squares method described by Keepin is used. The program is based on Moscati's program. (auth)

36163 (IFA-NR–24) GAMMA-RAY SPECTRA FOLLOWING THE DECAY OF ^{86}Br, ^{87}Br AND ^{88}Br. Cojocaru, V.; Nachman, M. (Institutul de Fizica Atomica, Academia R. P. R., Bucharest (Romania)). 1966. 11p. Dep. mn.

The gamma spectra of 1 min ^{86}Br + ^{87}Br and 15.5 sec ^{88}Br were investigated with a scintillation spectrometer. Gamma rays with energies of 0.22, 0.45, 0.61, 0.73, 0.84, 0.94, 1.27, 1.54 Mev and 0.026, 0.075, 0.111, 0.175, 0.216, 0.287, 0.320, 0.390, 0.528, 0.785, 1.09 Mev were found for ^{86}Br + ^{87}Br and ^{88}Br, respectively. Their relative abundances were measured. (auth)

36164 (INR-668/I/PH) CROSS SECTIONS FOR THE PRODUCTION OF THE ISOMERIC PAIR ^{58g,58m}Co IN THE ^{59}Co(n,2n)^{58}Co REACTION FOR THE NEUTRON ENERGY RANGE 13.2–15.7 Mev. Decowski, P.; Grochulski, W.; Marcinkowski, A.; Siwek, K.; Sledzinska, I.; Wilhelmi, Z. (Warsaw Univ. (Poland). Institute of Nuclear Research, Warsaw (Poland)). Dec. 1965. 11p. Dep.

The cross sections for the production of the isomeric pair ^{58m}Co and ^{58g}Co in the ^{59}Co(n,2n)^{58}Co reaction for the neutron energy range 13.2–15.7 Mev were measured and the isomeric cross-section ratios were obtained. Experimental results were compared with the theoretical predictions based on the model proposed by Vandenbosch and Huizenga. The parameter σ connected with spin dependence of the nuclear level density was estimated. (auth)

36165 (INR–688/I/PH) THE CROSS SECTIONS OF THE FISSION OF ^{239}Pu BY NEUTRONS IN THE 13.1 TO 15.4-Mev ENERGY RANGE. Czyzewski, T.; Decowski, P.; Fryszczyn, B. (Institute of Nuclear Research, Warsaw (Poland)). Feb. 1966. 7p. Dep.

An experiment is discussed in which the excitation curve of the neutron fission of ^{239}Pu with energies 13.1 to 15.4 Mev was measured. (B.G.D.)

36166 (INSJ–98) MEASUREMENT OF GAMMA RAYS FROM (p,2n) REACTIONS ON VIBRATIONAL NUCLEI. Ejiri, Hiroyasu; Ishihara, Masayasu; Inamura, Takashi; Katori, Kenji (Institute for Nuclear Study, Tokyo Univ. (Japan)). Apr. 26, 1966. 28p. Dep. mn.

Gamma rays from the (p,2n) reaction with 14.3-Mev proton on the vibrational nuclei were measured using a lithium drifted germanium semiconductor detector. The targets used were ^{103}Rh, ^{109}Ag, ^{121}Sb, ^{139}La and ^{197}Au. The properties of the gamma transitions were determined from their relative intensities and conversion coefficients by taking into account the previous results of the conversion electrons. The anisotropy of the gamma emission was measured and the degree of the spin alignment of the residual excited state was discussed in terms of the spin alignment in nuclear reaction. (auth)

36167 (ISS-66/20) STUDIO DELLE REAZIONI (e,e'p), (e,e'n), (e,e'α) UTILIZZANDO IL FASCIO ESTRATTO DELL'ELETTROSINCROTRONE DI FRASCATI (PROPOSTA D'ESPERIENZA). (Study of the Reactions (e,e'p), (e,e'n) and (e,e'α) Using the Extracted Beam of the Frascati Electron Synchrotron). Campos Venuti, G.; Cortellessa, G.; De Sanctis, E.; Farchi, G.; Frullani, S.; Lombard, R.; Salvadori, P. (Istituto Superiore di Sanita', Rome (Italy). Laboratori di Fisica). May 10, 1966. 64p. Dep. mn.

On the basis of the results obtained with (e,e'p) experiments, using the internal beam of the Frascati electron-synchrotron, a new experiment is proposed, using the external beam, to study the reactions (e,e'p), (e,e'n) and (e,e'α). After discussing the study of these reactions within the framework of nuclear physics research, different experimental solutions for detecting scattered particles and their advantages and disadvantages are examined. Due to the complexity of the measurements and the data reduction, the logic of the experiment is discussed. Finally, an estimate of the expected counting rate and the unavoidable accidentals is presented. (auth)

36168 (JINR–P-2713) PARAMETRY UROVNEI PLUTONIYA-239. (Parameters of ^{239}Pu Levels). Ryabov, Yu. V.; Wang, Yung-chang; Dermendzhiev, E.; Chang, Pei-shu (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1966. 18p. Dep. mn.

The fission and the radiative capture cross sections of ^{239}Pu were measured by the time-of-flight method with time resolution of about 0.06 μ s/m using the JINR fast pulsed reactor. The cadmium-loaded liquid scintillation detector was used to perform measurements. The values of Γ_f/Γ and $g\Gamma_n$ were obtained by the area method in the neutron energy region up to ~200 ev. (auth)

36169 (JINR–P-2725) POLYARIZATSIYA PROTONOV IZ REAKTSII ^{12}C(^{3}He,p$_0$)^{14}N. (Proton Polarization From the ^{12}C(^{3}He,p$_0$)^{14}N Reaction). Krauze, R.; Sizov, I. V.; Eler, G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1966. 12p. Dep. mn.

The left-right asymmetry in elastic scattering of protons from the ^{12}C(He-3,p$_0$)^{14}N reaction on carbon was measured using an electrostatic generator accelerating the ^{3}He ions. From the asymmetry measured the proton polarization is calculated at $E_{^3He}$ = 2.95 Mev. The polarization is found to be –0.43 ± 0.05; –0.27 ± 0.04; +0.09 ± 0.04 for the laboratory system angles 45, 90, 135°, respectively. (auth)

36170 (JINR–P-2739) IZMERENIE SMESI ^{95}Zr I ^{95}Nb S POMOSHCH'YU Ge(Li)-DETEKTOROV. (Measurement of ^{95}Zr and ^{95}Nb Mixture by Ge(Li) Detectors). Tsaletka, R.; Vrzal, Ya. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1966. 10p. Dep. mn.

Ge(Li) detectors were used to obtain more accurate γ-transition energies for ^{95}Zr (724 ± 1 and 756 ± 1 kev) and for ^{95}Nb (765 ± 1 kev). The ratio of these transitions for ^{95}Zr (K = 0.814) was determined. A good resolution

of Ge(Li) detectors allows a combined quantitative determination of ^{95}Zr and ^{95}Nb. (auth)

36171 (NP–16155) UNTERSUCHUNGEN ZUR VERTEILUNG DER KERNLADUNGSZAHL IN SPALTKETTEN DES ^{238}U. (Study on the Distribution of Nuclear Charge in the Fission Chain of ^{238}U). Grau, Adolf (Mainz Univ. (West Germany)). 1966. 125p. Dep. mn.

Thesis.

Making use of the high emanating power of uranyl-stearate, the cumulative yields of some fission gases were determined for the reaction ^{238}U (n_{14Mev}, f). Uranyl-stearate was irradiated with neutrons from the ^{3}H(d,n)^{4}He reaction, using a Cockcroft Walton-type accelerator as a neutron source. The stearate sample was placed at a distance of approximately 2 cm from target in an aluminum container which was evacuated to about 0.1 mm Hg. Irradiation times were 30 minutes and 3 hours, respectively. The irradiation container was lined with filter paper, sometimes also with copper foil. The decay products of the fission gases escaping from the sample completely deposited on the liner, from which the alkaline earth or rare earth daughters were separated and counted. The same elements were also isolated from the uranium fraction and counted in the same way. From the two activities the cumulative yields have been calculated. These are (in percent of total chain yield): ^{91}Kr 67.0, ^{92}Kr 48.2, ^{93}Kr 18.9, ^{94}Kr 3.3; ^{138}Xe 68.6, ^{140}Xe 54.8, ^{141}Xe 19.1, and ^{142}Xe 11.0. (auth)

36172 (NP–16190) MUON CAPTURE IN LITHIUM. Lodder, Adrianus (Stichting voor Fundamenteel Onderzoek der Materie, Utrecht). 1966. 92p. Dep. mn.

Thesis. Submitted to Vrije Universiteit, Amsterdam, Netherlands.

A discussion is presented of the expression suitable for total muon capture calculations. The method of the closure approximation is described. The pertaining formulas and wave functions are given for application of this method to ^{6}Li and ^{7}Li. The results for this method give rise to the conclusion, that for ^{6}Li there is agreement between theory and experiment, while for ^{7}Li there is a discrepancy. However, the unreliability of the closure approximation and results from application of the Z_{eff}^{4}-law create the expectation that this conclusion might be just the reverse. The giant resonance method is described. The formulas for this semiempirical method are derived and discussed. The difficulty which arises for nuclei with isospin $T \neq 0$, namely that after dipole gamma absorption more levels are excited than after muon capture, is solved with a projection technique. The available dipole gamma excitation experiments for ^{6}Li and ^{7}Li are reviewed. These experimental data have to be applied in the giant resonance method for obtaining the dipole contribution of the main matrix elements for muon capture. It turns out to be not yet possible to deduce an unambiguous curve for the dipole gamma cross section from these data. In contrast to the conclusion after the calculations with the method of the closure approximation, here agreement is found between theory and experiment for ^{7}Li, while for ^{6}Li there is a discrepancy. (M.O.W.)

36173 (ORNL–3931) PHOEBE: A CODE FOR CALCULATING BETA AND GAMMA ACTIVITY AND SPECTRA FOR ^{235}U FISSION PRODUCTS. Arnold, E. D. (Oak Ridge National Lab., Tenn.). July 1966. Contract W-7405-eng-26. 64p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

A computer code, PHOEBE, is presented for calculating the decay properties of mixed fission products resulting from the fission of ^{235}U. Fission product beta and gamma activity and spectra are calculated for these fission products as a function of power, irradiation time, and decay time. Either constant or variable power may be specified for the reactor operation period. The code contains a permanent data section that describes the release rates as a function of time since fission. A discussion of these data functions; that is, how they were obtained, how they are used, and how they may be modified is included. (M.O.W.)

36174 (PUC–937–163) ON THE CONNECTION BETWEEN THE NUCLEAR SHELL AND COLLECTIVE MODEL: THE PEIERLS-YOCCOZ MODEL WITH A ZERO-RANGE INTERACTION. Sharon (Schwadron), Yitzhak Yaakov (Princeton Univ., N. J. Palmer Physical Lab.). June 1965. Contract AT(30-1)-937. 403p. Dep. mn. CFSTI $7.03 cy, $1.75 mn.

Thesis.

The generator-coordinate wave function of Peierls and Yoccoz was used to demonstrate how nuclei may exhibit features of individual-particle motion for small nuclear deformations and yet display collective effects for large oblate or prolate deformations. Calculations were presented which explain why strong rotational effects could be found in the spectra of almost all nuclei if the deformation were sufficiently large. It was concluded that strong collective effects set in at deformations which decrease with increasing atomic weight. (B.G.D.)

36175 (RT-FI-(66)8) ON CIRCULAR POLARIZATION MEASUREMENTS IN γ-γ PERTURBED ANGULAR CORRELATIONS. Beltrametti, E. G. (Comitato Nazionale per l'Energia Nucleare, Rome (Italy)). 1966. 7p. Dep. mn.

The role of circular polarization measurements in γ-γ perturbed angular correlations is examined. It is shown, in particular, how the inapplicability of unpolarized correlations in searching for g-factors of spin-$\frac{1}{2}$ excited nuclear states, can be removed by allowing circular polarization detection. (auth)

36176 (TID–22971, pp 41–140) EXPERIMENTAL PROGRAM. (Minnesota Univ., Minneapolis. Linear Accelerator and Tandem Van de Graaff Lab.).

The experimental program at the Linear Accelerator and Tandem Van de Graaff Laboratory is outlined. The program includes polarized proton scattering experiments, elastic and inelastic proton scattering, pickup reaction studies, optical model studies, and distribution of ^{18}F in biological tissues. (B.G.D.)

36177 (UCRL–11980) NUCLEAR MASSES AND DEFORMATIONS. Myers, William D.; Swiatecki, Wladyslaw J. (Lawrence Radiation Lab., Univ. of California, Berkeley). May 27, 1965. Contract W-7405-eng-48. 398p. Dep. mn. CFSTI $6.00 cy, $1.75 mn.

A semi-empirical theory of nuclear masses and deformations is presented. The potential energy of a nucleus, considered as a function of N, Z, and the nuclear shape, is assumed to be given by the liquid-drop model, modified by a shell correction. The shell correction is a simple function of N and Z and is supposed to disappear as the nucleus is distorted away from the spherical shape. The resulting semi-empirical expression for the nuclear deformation energy has seven adjustable parameters, four in the liquid-drop part and three in the shell correction. By making the deformation energy stationary with respect to distortions, the equilibrium deformations (i.e., the quadrupole moments) and the ground-state masses of nuclei are derived as functions of N and Z. In addition, from unstable shapes of equilibrium corresponding to saddle-point configurations, barrier energies for nuclear fission are deduced. The predictions of the theory are compared with some 1200 experimental nuclear masses, 240 quadrupole moments, and 40 fission barriers. The results lead, on the one hand, to a re-assessment of the accuracy of the liquid-drop model and a firmer determination of its characteristic constants and, on the other, to a semi-quantitative understanding of the effects of shell structure on nuclear masses and deformations. A number of minor anomalies are isolated, one apparently related to the so-called Wigner Term in the binding energy and one relevant for the understanding of fission barriers. Applications to the analysis of the centrifugal stretching of nuclei and to the possible existence of "islands of stability" in the region of super-heavy nuclei are mentioned. An appendix lists the calculated properties (masses, quadrupole moments, fission barriers, etc.) of some 8000 particle-stable nuclei. (auth)

36178 (UCRL–14575) THE (n,2n) REACTION INDUCED BY 14.5-Mev NEUTRONS. Gardner, Donald G. (Lawrence Radiation Lab., Univ. of California, Livermore). Mar. 10, 1966. Contract W-7405-eng-48. 21p. (CONF-660303–46). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From American Physical Society, Conference of Neutron Cross Section Technology, Washington, D. C.

With a statistical-model approach the ratios of the cross sections for the (n,2n) reaction on adjacent isotopes of all elements in the range $30 \leq Z \leq 83$ have been computed as a function of energy. These ratios have been semiempirically normalized at 14.5 Mev to obtain predictions of absolute (n,2n) cross sections. This approach is compared with other methods for computing (n,2n) cross sections, and with available experimental data. The use of (p,2n) and (α,2n) cross sections to evaluate the importance of pairing effects is illustrated. Also, a few excitation functions are computed and compared with experimental data. (auth)

36179 (UJV–1612) THE CONFIGURATION SPLITTING OF THE DIPOLE GIANT RESONANCE FOR THE NON-MAGIC NUCLEI OF 1d-2s SHELL AS DEMONSTRATED BY ^{32}S. Goryachev, B. I.; Majling, L.; Neudatchin, V. G.; Yuryev, B. A. (Ustav Jaderneho Vyzkumu, Ceskoslovenska Akademie Ved, Rez). July 1966. 15p. Dep. mn.

It was shown by specific calculations for ^{32}S that the configurational splitting of the giant resonance is conserved even after the residual interaction was taken into account. The results for two cases are compared: ^{32}S as a closed sub-shell $1d_{\frac{5}{2}} + 2s_{\frac{1}{2}}$ and as a soft core distorted in particular, under the influence of the quadrupole vibrations. The most general features of the dipole absorption curve are comparatively stable with respect to the perturbation of the wave function of the ground state and at the same time the details of this curve are substantially different. The results of the calculations reproduce correctly the characteristic features of the absorption curve, in particular, a very considerable width of the absorption region. The fact that only the left part of the absorption curve is excited in the reaction (p,γ_0) and the elastic scattering cross section has two maxima finds good explanation. The calculations describe worse the photonucleon spectra. (auth)

36180 (USC–136-100) A FORTRAN PROGRAM FOR COMPUTING TWO-BODY KINEMATICS. Devins, D. W. (University of Southern California, Los Angeles. Nuclear Physics Lab.). Oct. 1965. Contract AT(04-3)-136. 8p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A computer program is presented which describes the following kinematics problem. An incident particle of mass M_0 and energy E_0 strikes a target nucleus. Two particles M_1 and M_2 making angles θ_1 and θ_2 with the incident direction exit with energies E_1 and E_2. Given θ_1, the program gives solutions for E_1, E_2, and θ_2. (M.O.W.)

36181 (USNRDL-TR–1009) CALCULATED ACTIVITIES, EXPOSURE RATES, AND GAMMA SPECTRA FOR UNFRACTIONATED FISSION PRODUCTS. Crocker, G. R.; Turner, T. (Naval Radiological Defense Lab., San Francisco, Calif.). Dec. 28, 1965. Contract AT(49-7)-1963. 194p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

Activities, exposure rates, and gamma-emission spectra were calculated for unfractionated fission products from thermal-neutron, fission-spectrum neutron, and 14-Mev neutron fission of ^{235}U; from fission-spectrum neutron fission of ^{233}U, ^{238}U, and ^{239}Pu; and from thermonuclear-spectrum neutron fission of ^{238}U. The activities and exposure rates at 29-time points were analyzed, and the contributions of the principal nuclides are presented graphically. The gamma-emission spectra for several fission cases at several different times are compared graphically. The Appendix presents all the data in tabular form. (auth)

36182 (ZFK-TPH–19) GEBUNDENE ZUSTAENDE UND WELLENFUNKTIONEN IM WOOD-SAXON-POTENTIAL. (Bound States and Wave Functions in Wood-Saxon Potential). Slotta, Johannes; Pfitzner, Alfred; Reif, Roland (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (East Germany)). Aug. 1965. 12p. Dep. mn.

A numerical procedure is given to solve the following two problems: Fitting of the potential depth and the spin-orbit-strength of a Wood-Saxon-potential so as to reproduce two known discrete energy levels and evaluation of the two corresponding wave functions and determination of the discrete energy spectrum and the corresponding wave-functions for a Wood-Saxon potential with given parameters. (auth)

36183 (AEC-tr–6465) NUCLEAR REACTIONS IN THE LOW AND INTERMEDIATE ENERGY RANGES. Proceedings of the Second All-Union Conference, July 1960. Frank, I. M. (ed.) Translation of Yadern. Reaktsii Malykh Srednikh Energ., Akad. Nauk SSSR, Tr. Vtoroi Vses. Konf., Moscow, 1960(Pub. 1962). 696p. (IPST-Cat.–1240; CONF-600702). Dep. CFSTI $9.96 cy.

Original Russian in NSA, 17: 29637.

36184 NUCLEAR REACTIONS. Wilson, H. W. (Scottish Research Reactor Center, Glasgow). pp 9-12 of Activation Analysis, Principles and Applications. Lenihan, J. M. A.; Thomson, S. J. (eds.). New York, Academic Press, 1965.

The discovery of nuclear reactions is recounted with a short history of laboratory-controlled reactions. The principle of activation analysis and some uses are discussed. Definitions of elementary-reaction terms are given. (P.C.S.)

36185 PROCEDURES FOR THE INVESTIGATION OF DISINTEGRATION SCHEMES. A. GENERAL PROCEDURES. Mitchell, Allan C. G. pp 467-500 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

The general processes and procedures used in determining disintegration schemes from measurements of beta and gamma spectra are discussed. Examples are given to illustrate the main features of the methods. 38 references. (L.B.S.)

36186 PROCEDURES FOR THE INVESTIGATION OF DISINTEGRATION SCHEMES. B. SCINTILLATION SPECTRA ANALYSIS. Van Lieshout, R.; Wapstra, A. H.; Ricci, R. A.; Girgis, R. K. pp 501-38 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

A review is given of the technique for graphical analysis of γ-spectra obtained with scintillation spectrometers. Methods for reducing secondary effects in pulse-height distributions, the selection of source-crystal geometry, and the determination of the response function are discussed. The determination of gamma energies and intensities are treated. The use of scintillation counters for measurement of beta spectra is also considered. 57 references. (L.B.S.)

36187 THE SHELL MODEL. A. SHELL CLOSURE AND jj COUPLING. Mayer, Maria Goeppert; Jensen, J. Hans D. pp 557-82 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

The shell-model treatment of nuclear structure is reviewed. Shell closure is discussed on the basis of evidence obtained from β-energy systematics. The sequence of nuclear ground states as a function of Z and N is discussed in the jj coupling model, and a survey of the ground state configurations of odd A nuclei with odd Z or odd N up to 87 is presented. The consequences of the shell model for alpha and beta decay are briefly considered. 25 references. (L.B.S.)

36188 THE SHELL MODEL. B. INTERMEDIATE COUPLING. Kurath, D. pp 583-99 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

Modifications of the independent-particle model are briefly discussed, which takes into account the effect of residual interactions in nuclear spectra calculations. Intermediate coupling calculations for light nuclei are discussed, and some examples are given. (L.B.S.)

36189 COLLECTIVE NUCLEAR MOTION AND THE UNIFIED MODEL. Nathan, O.; Nilsson, S. G. pp 601-700 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

A general treatment is presented on collective nuclear motion in the unified model. Topics discussed include pair and aligned coupling schemes for nucleon correlations; polarization effects of particles outside closed shells; quasi-particle and vibrational spectra in spherical nuclei; nuclei with stable quadrupole deformations; and microscopic theory of collective motion and theoretical estimates of the collective parameters. 84 references. (L.B.S.)

36190 GAMMA RADIATION FROM CHARGED PARTICLE BOMBARDMENT; COULOMB EXCITATION. Alburger, D. pp 745-68 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

Theoretical and experimental studies of gamma radiation emitted in nuclear reactions, which yield information on nuclear structure, are reviewed. 36 references. (L.B.S.)

36191 NEUTRON-CAPTURE RADIATION SPECTROSCOPY. Motz, H.; Baeckstroem, G. pp 769-804 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

A review is presented on theoretical and experimental aspects of neutron capture spectroscopy, which yields information concerning level decay and properties of transitions of the compound nucleus in the neutron capture process. Experimental arrangements and methods for investigating thermal gamma-ray spectra are discussed. Internal conversion measurements and coincidence techniques are also reviewed. The determination of properties of levels and decay schemes of compound nuclei are briefly discussed. 113 references. (L.B.S.)

36192 GAMMA RADIATION FROM FISSION. Johansson, S. A. E.; Kleinheinz, P. pp 805-26 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

Experiments dealing with the gamma radiation emitted from fission fragments after neutron emission but before beta decay are described and discussed. Measurements of prompt and delayed gamma radiation are described, and interpretations given to the results are discussed. 34 references. (L.B.S.)

36193 CRITICAL POTENTIALS AND ELASTIC SCATTERING OF CHARGED PARTICLES. Lebon, G. (Univ., Liege). Bull. Soc. Roy. Sci. Liege, 35: No. 1-2, 76-86 (1966). (In French).

The definition of a critical potential is extended to the case of the elastic scattering of a charged particle by a spherically symmetric potential. Numerical data are given in two particular cases. (auth)

36194 ANALYSIS OF THE ELASTIC SCATTERING BY ^{12}C OF DEUTERONS WITH ENERGY BETWEEN 1 AND 1.5 Mev. Lambert, Michel; Foucou, Madeleine (Institut d'Etudes Nucleaires, Algiers). Compt. Rend., Ser. B, 262: 1547-50(June 13, 1966). (In French).

The analysis of the elastic scattering by ^{12}C of deuterons with energy between 1 and 2 Mev indicate very probable determinations for the spin and the parity of 3 excited levels of the compound nucleus ^{14}N corresponding to the resonances at 1.19 Mev (2^-), 1.33 Mev (1^+), and 1.465 Mev (3^+). (tr-auth)

36195 RATIO OF THE INTERNAL CONVERSION COEFFICIENTS OF THE L AND M SUBSHELLS OF THE PURE E2 TRANSITION OF 84.3 kev OF ^{170}Yb. Jourdan, Alfred; Gizon, Jean (Faculte de Sciences, Grenoble, France. CEN, Grenoble, France). Compt. Rend., Ser. B, 262: 1551-4(June 13, 1966). (In French).

The half life of ^{170}Lu is 51.0 ± 0.5 hrs. The ratios $M_I/M_{II}/M_{III}/M_{IV} + M_V$ are 7.4/90.5/100/2.6 for the 84.3-kev transition of ^{170}Yb. The α_{M_i} coefficients are in agreement with the values deduced from the semi-empirical corrections of Chu and Perlman, with the exception of α_{M_I} (tr-auth)

36196 SPIN DEPENDENCE OF ASYMMETRY IN μ-CAPTURE REACTIONS. Bobodzhanov, I. B.; Ivanenko, V. M.; Kashkarov, L. L.; Cherdyntsev, V. V. Dokl. Akad. Nauk Tadzh. SSR, 7: No. 12, 7-10(1964). (In Russian).

Nuclear spin effects on the asymmetry of neutron emission in (μ,n) reactions was studied by observing the neutron distribution resulting from cosmic mesons (μ) bombarding bismuth, lead, copper, and iron targets. Angular distribution coefficients, and the degree of polarization of the meson (μ) at the moment of capture are given. (J.F.P.)

36197 NONCONSERVATION OF PARITY IN THE INTERACTION OF μ-MESONS OF COSMIC RAYS WITH MATTER. Ivanenko, V. M.; Kashkarov, L. L.; Cherdyntsev, V. V.; Ryazanov, D. K.; Bobozhanov, I. B. Izv. Akad. Nauk Tadzh. SSR, Otd. Geol.-Khim. Tekh. Nauk, No. 1, 9-30(1963). (In Russian).

Parity nonconservation in weak interactions of the capture type was studied by observing the n from (μ^-,n) reactions and the coincidence of the μ^- and n impulses. An anisotropic distribution of neutrons was found in lead, bismuth and iron which shows that parity is not conserved during meson (μ^-) capture. Asymmetry effects are observed for lead and bismuth nuclei. It is indicated from these effects that a combination of the V and A variants of the interaction predominates in the capture process. (J.F.P.)

36198 SCHEMATIC THEORY OF ISOBARIC ANALOGUE RESONANCES. Weidenmueller, Hans A. (Univ., Heidelberg). Nucl. Phys., 85: 241-60(1966).

A schematic theory of the isobaric analog resonances based upon a shell-model approach is presented. The single-particle, shell-model hamiltonian H_0 is assumed to contain the average Coulomb interaction for the protons. The role of the isospin operator T in a problem in which H_0 does not commute with T^2 is discussed, and it is shown schematically how the isobaric analog resonances arise. These resonances represent doorway states of an unusual nature. They are linear superpositions of single-particle resonances and particle-hole states. The form of the partial widths and their relationship with single-particle widths are established. A comparison with the theory of Robson is carried through. Both formulations are shown to rest upon the same physical assumptions, but to differ formally. The present approach does not make use of the Lane equations and treats all nucleons in a symmetric fashion. (auth)

36199 NUCLEAR ROTATION AND THE PAIRING CORRELATIONS. Chan, K. Y. (NORDITA, Copenhagen). Nucl. Phys., 85: 261-72(1966).

The coupling effects between nuclear rotation and the pairing correlations are studied. The pairing correlations are characterized by a gap parameter Δ satisfying a rotation-dependent "gap" equation. With the help of the Nilsson model, curves of Δ as a function of the angular frequency are obtained for a number of nuclei in the deformed region. The results are found to agree with previously reported results. The moments of inertia of the various nuclei are calculated in the model as functions of the angular momentum I. Their dependence on I compares favorably with the empirical behavior. A quantitative comparison of quantities calculated in the model with the empirical values is made by expanding the rotational energy in powers of $I(I + 1)$ and determining the coefficients of expansion. It is found that in addition to the first coefficient, the second coefficient is also well reproduced in the model, showing that a major part of this coefficient can also be accounted for in terms of the rotation-pairing coupling effect for the nuclei under consideration. (auth)

36200 OPTICAL POTENTIAL FOR DEUTERON SCATTERING FROM CARBON. Satchler, G. R. (Oak Ridge National Lab., Tenn.). Contract W-7405-eng-26. Nucl. Phys., 85: 273-87(1966). (ORNL-P-2123).

The available data for the elastic scattering of deuterons by ^{12}C for energies from 3 to 34 Mev are analyzed in terms of the optical model including spin-orbit coupling. Two potentials are found, with a fixed real part and imaginary parts whose strength and radius depend linearly on the energy, which give a good account of all these data. There is

some difficulty with the choice of diffuseness for the imaginary potential. The real potential is compared to the predictions of a simple model. The inelastic scattering to the 4.43 Mev state is discussed. (auth)

36201 DECAY OF ^{98}Nb AND THE ENERGY LEVELS OF ^{98}Mo. Gujrathi, S. C.; Mukherjee, S. K. (Saha Inst. of Nuclear Physics, Calcutta). Nucl. Phys., 85: 288-304 (1966).

The ^{98}Nb nucleus is produced by the ^{98}Mo(n,p)^{98}Nb reaction with 14.8 Mev neutrons. The decay was studied by standard scintillation spectroscopy techniques. A quick radiochemical separation was employed to separate Nb from Mo and Zr. The half life measurements give two 51 ± 1 and 1.5 ± 0.5 min activities associated with ^{98}Nb. The beta and gamma measurements show four beta groups of maximum energies 3.1 ± 0.1 (8%), 2.32 ± 0.1 (38%), 1.94 ± 0.1 (29%) and 1.42 ± 0.1 (25%) Mev and 12 gamma rays of energies 0.080, 0.170, 0.330, 0.450, 0.720, 0.780, 1.16, 1.44, 1.52, 1.68 and 1.94 Mev, which decay with a half life of 51 ± 1 min. Levels are proposed in ^{98}Mo at 0.780, 1.50, 1.95, 2.28, 2.66, 2.94, 3.02 and 3.19 Mev and a decay scheme is suggested. The value Q_β for the ^{98}Nb−^{98}Mo transition is 4.6 ± 0.1 Mev. The (n,p) cross sections for ^{98}Mo were measured as 12 ± 2 mb and 2 ± 1 mb for the 51 min and 1.5 min states, respectively. The half life of ^{100}Nb was measured as 2.8 ± 0.2 min. (auth)

36202 LOW-ENERGY NEUTRON RESONANCE PARAMETERS OF ^{238}U. Asghar, M.; Chaffey, C. M.; Moxon, M. C. (Atomic Energy Research Establishment, Harwell, Eng.). Nucl. Phys., 85: 305-16(1966).

Neutron capture and neutron elastic scattering measurements were made on ^{238}U. These data are combined, and the resonance parameters Γ_n and Γ_γ, for 27 resonances in the energy range from 6.65 ev to 823 ev, are reported. The present value of s-wave strength function of $(0.70 \pm 0.15) \times 10^{-4}$, obtained from these parameters, is in reasonable agreement with the published values. Although the present values of Γ_γ have higher accuracy than the values reported by other authors, the errors are not small enough to draw any definite conclusions about the intrinsic spread in their values. The weighted mean value of Γ_γ is 23.74 ± 1.09 Mev where the error includes ± 0.86 Mev associated with the systematic uncertainties in the capture measurement. A standard deviation of 1.9 ± 1.2 Mev was found for the assumed Gaussian frequency distribution of the total radiation widths. (auth)

36203 BETA SPECTRA IN THE DECAY OF ^{32}P AND ^{124}Sb. Canty, M. J.; Davidson, W. F.; Connor, R. D. (Univ. of Manitoba, Winnipeg). Nucl. Phys., 85: 317-26 (1966).

In disagreement with recent suggestions that the beta spectrum of ^{32}P displays a nonallowed shape with a discontinuous slope to the shape factor, it was found that this transition displays the statistical shape with $W_0 = 1697 \pm 2$ kev. Non-statistical shapes can be simulated with adequate attention to source quality or having a small error in the endpoint energy W_0. It is shown that shape factor coefficients are so extremely sensitive to W_0 as to make their utility doubtful. In view of existing uncertainties, a new determination of the shape factor of the highest energy first-forbidden non-unique beta transition in ^{124}Sb confirms the "modified B_{ij} approximation" of Kotani and shows a shape factor $C(W) = q^2 + \lambda_1 p^2 + D$ with $D = 7 \pm 2$. The end-point energy is $W_0 = 2301 \pm 4$ kev. (auth)

36204 INGOING WAVE BOUNDARY CONDITION ANALYSIS OF ALPHA AND DEUTERON ELASTIC SCATTERING CROSS SECTIONS. Rawitscher, G. H. (Max-Planck-Institut fuer Kernphysik. Heidelberg). Nucl. Phys., 85: 337-64(1966).

An ingoing wave boundary condition calculation (IWB) is used to obtain elastic alpha-Ni scattering cross sections at the lab energies of 25, 33, 43, 50 and 85 Mev and the deuteron-Cu cross section at 11.8 Mev. The calculation is done numerically on an IBM 7090 and is similar to optical model calculations (OM) with the exception that at small distances an ingoing wave boundary condition is imposed on the partial waves. The method describes diffraction by an absorbing sphere and can be considered as providing an extension valid out to large angles of Frauenhofer diffraction formulas in which surface potentials are rigorously included. The experimental alpha scattering data at 33, 50, and 85 Mev are limited to the forward hemisphere and are found to be consistent with the IWB calculations. The diffuseness of the surface potentials as well as the amount of imaginary potential present at the surface is found to increase with energy. The 25 Mev data are not consistent with the calculation. The 43 Mev data extend to 140° and good agreement is found to about the fifth or sixth diffraction minimum. Comparison between optical model and IWB calculations are carried out for this case, and good agreement is found up to large angles (the eleventh diffraction peak) although the optical model result gives a better fit to the data. The deuteron scattering IWB calculations gives poor agreement with both an optical model calculation and the experiment. Nevertheless, the IWB and OM phase shifts have the same average behavior as a function of angular momentum number. (auth)

36205 TIME-DEPENDENT HARTREE-FOCK THEORY AND NUCLEAR VIBRATIONAL MODELS. Rowe, D. J. (Atomic Energy Research Establishment, Harwell, Eng.). Nucl. Phys., 85: 365-92(1966). (TP-209).

A quantal interpretation of time-dependent Hartree-Fock (TDHF) theory was previously developed, which demonstrated its equivalence to the random phase approximation (RPA), but which was much more physical. Here this approach is pursued to derive a quantal version of the vibrating potential model (VPM). It is derived explicitly as an approximate and simplified version of the TDHF method, and such that the approximations are clearly defined. The model is then used to derive and to exhibit the approximations implied in a number of other vibrational models. It thus appears as the vital link in the chain which relates the phenomenological collective models to the RPA and gives a unified theory of nuclear vibrations. (auth)

36206 ELECTRIC DIPOLE AND OCTUPOLE TRANSITIONS IN ^{88}Sr. Shastry, S.; Saha, A. K. (Saha Inst. of Nuclear Physics, Calcutta). Nucl. Phys., 85: 393-400 (1966).

Exact zero-range force calculations were performed to explain the collective nature of the 2.76 Mev 3^- state of ^{88}Sr. The results show that the E1 transition is in good agreement with experiment while the E3 transition falls short by a factor of 10. (auth)

36207 INTERACTION-REGION MODEL OF QUANTAL SCATTERING PROCESSES. Corbett, John V. (Univ. of New South Wales, Sydney. Univ., Adelaide). Nucl. Phys., 85: 401-30(1966).

A different formulation of the nonrelativistic quantum theory of scattering is presented. The interactions which govern the scattering are described by the modifications of the incident wave function on a spherical surface surrounding the region in which the interaction occurs. The model is shown to give unequivocal solutions to the scattering problem when either Dirichlet or Neumann boundary values are prescribed for the modified wave function. The model is applied to a problem in nuclear physics and is also used to discuss the uniqueness of single-particle, phenomenological potentials of arbitrary symmetry when the potential is fitted to the complete angular distribution at a single energy. The modifications of this model which are necessary for the inclusion of particles with spin and charged particles are also discussed. (auth)

36208 M1 TRANSITIONS IN THE ^{35}Cl(n,γ)^{36}Cl REACTION. Gersch, H. U.; Doenau, F. (Deutsche Akademie der Wissenschaften, Berlin. Zentralinstitut fuer Kernforschung, Rossendorf, Ger.). Nucl. Phys., 85: 431-41 (1966).

The M1 transition probabilities expected in the ^{35}Cl(n,γ)-^{36}Cl reaction are calculated. For that purpose the lowest states were expressed by the wave functions proposed by

Glaudemans, Wiechers and Brussaard. The compound state was represented by a mixing of states according to the theory of Block and Feshbach. It seems that the Glaudemans functions that play an essential role are those that lie in the neighborhood of the neutron binding energy. They represent in the terminology of Block and Feshbach the simplest doorway states. The contributions of these doorway states were obtained by a fitting procedure, corresponding to the expected distribution with a width of about 2 Mev. The considerations show further that is is not permissible to determine the radiation type only by comparison of the measured intensities. (auth)

36209 THEORETICAL INVESTIGATIONS OF RADIATIVE FIRST-FORBIDDEN BETA DECAY. Pham Xuan Yem (Institut de Physique Nucleaire, Orsay, France). Nucl. Phys., 85: 442-8(1966).

The Coulomb effect in internal bremsstrahlung associated with first-forbidden beta decay is treated without approximations. The virtual β-γ transitions are also evaluated, and applications to ^{90}Y, ^{91}Y, and RaE are given. (auth)

36210 IMPROVED INDEPENDENT-PAIR METHOD FOR FEW-NUCLEON PROBLEMS. Folk, R. (Lehigh Univ., Bethlehem, Pa. Oak Ridge National Lab., Tenn.). Nucl. Phys., 85: 449-60(1966).

The independent-pair method as used by Mang and Wild in their analysis of the three- and four-nucleon systems is shown to yield wave functions that are accurate for particle separations up to a few fm. For larger separations, the independent-pair function is continued smoothly by attaching a variational function which has only one free parameter. By varying this one parameter, accurate wave functions are obtained for three example three-body hamiltonians, two of which have hard-core potentials. Upper and lower bounds are calculated for the ground state energies. (auth)

36211 LIFETIME MEASUREMENTS IN ^{14}N, ^{15}N, AND ^{22}Ne. Lieb, K. P. (Univ., Freiburg i. B.). Nucl. Phys., 85: 461-75(1966). (In German).

The Doppler shift attenuation method was used to measure the lifetimes of some excited states in ^{14}N, ^{15}N, and ^{22}Ne. The states of ^{14}N were produced by the reaction ^{12}C(^{3}He,p)^{14}N. The mean lifetimes of the $J^\pi = 0^+$ state at 2.31 Mev and $J^\pi = 1^+$ state at 3.95 Mev excitation were found to be $\tau = 0.083 \pm 0.019$ ps and $\leqq 0.087$ ps, respectively. The 7.16 Mev and 7.57 Mev states in ^{15}N, populated by the reaction ^{13}C(^{3}He,p)^{15}N, were found to have mean lifetimes $\tau = 0.115 \pm 0.025$ ps and $\tau = 0.15 \pm 0.05$ ps, respectively. The first excited state of ^{22}Ne was studied by the reaction ^{19}F(^{4}He,p)^{22}Ne. The mean lifetime of this state is $\tau = 8 \pm 3$ ps. The results obtained are compared with predictions of nuclear models. (auth)

36212 MEASUREMENT OF (n,p) AND (n,α) REACTION CROSS SECTIONS AT 14.8 Mev. Prasad, R. (Muslim Univ., Aligarh, India); Sarkar, D.C.; Khurana, C. S. Nucl. Phys., 85: 476-80(1966).

Total cross sections for the following reactions have been measured by the activation technique at 14.8 Mev neutron energy: ^{15}N(n,p)^{15}C, 16 ± 4 mb; ^{16}O(n,p)^{16}N, 29 ± 2 mb; ^{19}F(n,p)^{19}O, 51 ± 10 mb; ^{23}Na(n,p)^{23}Ne, 45 ± 5 mb; ^{25}Mg(n,p)^{25}Na, 54 ± 6 mb; ^{34}S(n,p)^{34}P, 32 ± 8 mb; ^{100}Ru(n,p)^{100}Tc, 15 ± 6 mb; ^{102}Ru(n,p)^{102}Tc, 2 ± 0.5 mb; ^{19}F(n,α)^{16}N, 24 ± 5 mb; ^{26}Mg(n,α)^{23}Ne, 83 ± 7 mb; ^{37}Cl(n,α)^{34}P, 28 ± 10 mb; ^{71}Ga(n,α)^{68}Cu, 60 ± 4 mb; and ^{103}Rh(n,α)^{100}Tc, 80 ± 7 mb. (auth)

36213 COLLISION INTEGRAL FOR ANISOTROPIC CHAIN-TYPE NUCLEAR REACTIONS. Amster, Harvey (Univ. of California, Berkeley); Perkins, S. T. Nucl. Sci. Eng., 25: 440-2(1966).

The reactions considered in the discussion of the collision integral for anisotropic chain-type nuclear reactions are described as a series of time-sequential two-body breakup processes. The assumptions made are the target nucleus at rest, the overall reaction occurring at a single point in space, i.e., instantaneous decays, and the decays (or scattering) azimuthally symmetric with respect to the direction of motion of the incident particle in the link. This implies isotropic media and no effects due to polarization either of the incident neutrons or induced in the reaction. (J.F.P.)

36214 ISOSPIN AND FRACTIONAL-PARENTAGE STUDIES WITH NUCLEON TRANSFER REACTIONS. Poth, J. E.; Birnbaum, J.; Bromley, D. A. (Yale Univ., New Haven). Phys. Rev. Lett., 17: 200-3(July 25, 1966).

A measurement which examined the isospin purity selectivity in the nuclear surface region is reported. The reactions selected were ^{12}C(^{14}N,^{15}N)^{11}C and ^{12}C(^{14}N,^{15}O)^{11}B, corresponding to single-neutron and single-proton transfer, respectively. The results of these reactions were used to determine the ^{10}B + n and ^{10}Be + p parentage of the ^{11}B ground state from (^{11}B,^{10}B) and (^{11}B,^{10}Be) reactions on targets of ^{12}C, ^{13}C, ^{14}N, ^{15}N, ^{16}O, and ^{20}Ne. (C.E.S.)

36215 GAMMA-GAMMA ANGULAR CORRELATION MEASUREMENTS OF THERMAL-NEUTRON-CAPTURE GAMMA RAYS IN ^{150}Sm. Cojocaru, V.; Petrascu, M.; Stanciu, M. (Inst. of Atomic Physics, Bucharest). Rev. Roum. Phys., 11: 283-99(1966).

The angular correlation measurements of gamma rays emitted in the thermal-neutron capture reaction in ^{149}Sm are presented. An angular correlation installation with two NaI(Tl) scintillation spectrometers and a sum-coincidence circuit is used. Several energy levels and transitions are identified. The spins and parities of some levels are indicated and the multipolarity mixture parameters of some transitions are determined. (auth)

36216 STRUCTURE OF THE ^{16}O(γ,n)^{15}O CROSS SECTION. Baciu, G.; Catana, D.; Deberth, C.; Raileanu, I. (Inst. of Atomic Physics, Bucharest). Rev. Roum. Phys., 11: 301-8(1966).

The absolute cross section for the (γ,n) reaction in ^{16}O was measured by using the bremsstrahlung of the betatron with the maximum energy of 25 Mev. The induced radioactivity in the irradiated samples of BO_3H_3 was recorded by means of a $\gamma-\gamma$ scintillation spectrometer. The data supplied by the spectrometer were recorded by a SA−40 type (Intertechnique) multichannel analyser. The yield points were taken at .250 Mev intervals. The betatron energy scale stability was controlled at least two times per day and a deviation smaller than ±10 kev was observed. The calculated cross section shows several discrete resonances, i.e., those disposed at lower energies display a Gauss shape while the fine structure of the giant resonance is well described by Lorentz shapes. The maxima occur at 16.15, 17.15, 18.00, 19.35, 21.00, 22.40, 23.25, and 24.00 Mev. The half width, the integrated cross section, and strengths for each peak are indicated. The integrated cross section up to 24.5 Mev shows a values of 23 ± 3 mb. Mev. The experimental data are compared with the theoretical predictions. (auth)

36217 ANALYSIS OF A COMPLEX GAMMA SPECTRUM. Ionescu, Constantza; Ionescu-Pallas, N. J. (Inst. of Atomic Physics, Bucharest). Rev. Roum. Phys., 11: 349-56(1966).

A qualitative method is expounded for the analysis of a complex gamma spectrum. The procedure is based on a mathematical transformation of the pulse height distribution given by a NaI(Tl) scintillation spectrometer. A remark is also made on the possibility of applying the algebraic calculus to the case of symmetrical spectra. (auth)

36218 MESON THEORY OF NUCLEAR FORCES. Taketani, Mituo (Kyoto Univ.). 17p. (CONF-650947-3). ORAU. Gmelin, AED-CONF-65-317-4.

From International Conference on Elementary Particles, Kyoto.

In the discussion of the meson theory of nuclear forces the historical development of this theory, particularly in Japan, is considered. A discussion of the one-boson-exchange model is included. (J.F.P.)

36219 ACOUSTIC NOISE FROM CHAIN REACTING SYSTEMS. Snyder, T. M. 6p. (CONF-650927-9). ORAU. Gmelin, AED-CONF-65-222-38.

From American Physical Society Meeting, Honolulu, Hawaii.

An analysis was undertaken to determine the character and magnitude of the acoustic noise from mechanical disturbances caused by the fission of a chain reacting system. The noise intensity and spectrum for a large power reactor was found to be very low in intensity, which is extremely difficult to measure above background noise. (J.F.P.)

36220 TRANSEC: FORTRAN PROGRAM FOR CALCULATING ANGULAR DISTRIBUTIONS OF GAMMA RAYS USING SATCHLER FORMALISM. Mathur, S. C.; Buchanan, Patricia S.; Morgan, I. L. (Texas Nuclear Corp., Austin). 41p. (CONF-651015-10). ORAU. Gmelin, AED-CONF-65-312-11.

From American Physical Society Meeting, Chicago.

A FORTRAN program "TRANSEC" is described which is capable of handling a large mass of angular distribution calculations based on Satchler formalism. The coding of the program is in FORTRAN-63 language adapted for a CDC-1604 computer. (J.F.P.)

36221 INTERNAL CONVERSION PROCESSES. Including the Proceedings of the International Conference on the Internal Conversion Process, May 10 13, 1965, Vanderbilt University, Nashville, Tennessee. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966. 691p. (CONF-650525).

The conference included 69 papers, 9 of which were abstracted previously in NSA as 19: 27548, 30522, 37826, 37827, 37837, 39786, 40880, 41679, and 41680. Separate abstracts were prepared for 56 papers. The remaining papers were in the form of short notes only. (J.F.P.)

For abstracts of individual papers see: 35779–35783, 36003, and 36222–36271.

36222 INTERNAL CONVERSION PROCESSES—YESTERDAY AND TODAY. Hamilton, J. H. (Vanderbilt Univ., Nashville). pp 1-13 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A historical review is given for the study of internal conversion. The development of this study is followed from the first observation that there were groups of monoenergetic electrons emitted in radioactive decay to measurements of K, L, and M conversion coefficients. (J.F.P.)

36223 INTERNAL CONVERSION THEORY. Rose, M. E. (Univ. of Virginia, Charlottesville). pp 15-33 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A discussion of the results of internal conversion calculations are presented. Electromagnetic transitions in nuclei, formal considerations and definitions, nuclear size, angular correlation, and dynamic structure effects with nuclear models are discussed. (J.F.P.)

36224 EXPERIMENTAL METHODS FOR THE DETERMINATION OF INTERNAL CONVERSION COEFFICIENTS. van Nooijen, B. (Vanderbilt Univ., Nashville). pp 35-55 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A survey is presented of the most important experimental techniques which are available for the measurement of internal conversion coefficients. The discussion is limited to K-conversion coefficients since the methods to be discussed are in principle applicable to L-conversion coefficients also. Methods involving coincidence techniques, the K-conversion peak-to-beta-spectrum, the internal-external conversion, normalized K-conversion peak-to-gamma peak, and the K x-ray peak-to-gamma-peak methods are described, and some other methods are also mentioned. (J.F.P.)

36225 REMARKS ON CONVERSION ELECTRON-GAMMA DIRECTIONAL CORRELATIONS. Gerholm, T. R.; Pettersson, B.-G. (Univ., Stockholm). pp 57-73 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

Electron-gamma directional correlation measurements are discussed. The disadvantages in obtaining experimental results and the means of overcoming these disadvantages are mentioned. The advantages in determining nuclear properties especially when the conversion takes place within the nucleus are mainly considered. (J.F.P.)

36226 RECENT DEVELOPMENTS IN THE INTERNAL-EXTERNAL CONVERSION (IEC) METHOD. Hultberg, Soelve (Research Inst. for Physics, Stockholm). pp 125-39 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The internal-external conversion (IEC) method for the experimental determination of internal conversion coefficients (ICC) by measuring separately the quantities that define the ICC, i.e., the emission rates of internal conversion electrons and the accompanying gamma rays is discussed. Topics considered are the theory, representation of scattering, geometry correction, gamma-ray attenuation correction, and the present status of the IEC method. It is concluded that the IEC method for determining ICC values is developed to a point where it can quite safely be used under most varying experimental conditions. (J.F.P.)

36227 RECENT DETERMINATIONS OF CONVERSION COEFFICIENTS OF E2 TRANSITIONS OBTAINED FROM COINCIDENCE TECHNIQUES AND THE PEAK-TO-BETA SPECTRUM METHOD. Lewin, W. H. G. (Reactor Instituut Delft, Delft, Netherlands). pp 163-71 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The K conversion coefficients of the 412-kev transition in ^{198}Hg and of the 368-kev transition in ^{200}Hg are reinvestigated. It is concluded from the results that only the K-conversion coefficients of unhindered E2 transitions in the Z = 80 region agree with theory within a few per cent. The method was applied to determine the total conversion coefficient of the 86.8-kev transition in ^{160}Dy, and the shape of the 961-kev beta branch in ^{198}Au is discussed. (J.F.P.)

36228 BETA SPECTRUM OF ^{198}Au, AND THE CONVERSION COEFFICIENTS OF THE 412-kev LINE IN ^{198}Hg. Parsignault, D. (California Inst. of Tech., Pasadena). pp 173-82 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966. (CALT-63-24).

The coincidence method was used to measure the β spectrum in coincidence with the 412-kev transition ($2+ \rightarrow 0+$) of gold-198 in order to determine the exact shape of the β spectra above 280 kev. The Fermi-Curie plot and the shape factor for the β transition $2^- \rightarrow 2^+$ for gold-198 are shown. Conversion coefficients of the 412-kev gamma ray from ^{198}Hg are also given. (J.F.P.)

36229 CONVERSION COEFFICIENT MEASUREMENTS EMPLOYING MAGNETIC AND SOLID-STATE SPECTROMETERS. van Nooijen, B. (Vanderbilt Univ., Nashville); Ramayya, A. V.; Hamilton, J. H.; Pinajian, J. J.; Johnson, N. R. pp 193-6 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The gamma rays of strontium-86 were observed using a p-i-n lithium-drifted germanium detector. Typical spectra are shown in the energy range 300 to 3000 kev. The relative intensities, K conversion coefficients, and probable multipolarities assigned to the gamma rays are tabulated. The accuracy obtained was of the order of 8 to 10%. (J.F.P.)

36230 ANOMALOUS K/L RATIO OF THE CONVERSION ELECTRONS FROM (p,2n) REACTIONS. Sakai, M.; Yamazaki, T.; Ejiri, H. (Tokyo Univ.). pp 197-200 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

It is noted that the anomalous K/L ratio for the conversion electrons from (p,2n) reactions with vibrational and transitional nuclei might be partly attributed to the difference of angular distribution between K and L conversion electrons. Also measurements of angular distribution of K and L conversion electrons and K/L values can provide information about spin values of the states involved

in the transitions and about momentum change in formation and decay of compound nuclei. It is also noted that the conversion electrons are probably affected by the rearrangement of external electron orbits in the nuclear reaction. If this is the case, such measurements might open a new intermediate research field between nuclear and atomic physics. (J.F.P.)

36231 MEASUREMENT OF ELECTRON CAPTURE RATIOS AND INTERNAL CONVERSION COEFFICIENT RATIOS WITH A SOLID STATE DETECTOR. Durosinmi-Etti, I. O.; Brundrit, D. R.; Sen, S. K. (Univ. of Manitoba, Winnipeg). pp 201-11 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The electron-capture decay of ^{113}Sn to the 393-kev level of ^{113}In and ^{109}Cd electron-capture decay was investigated. The conversion electron and gamma spectra are shown for ^{113}In and ^{109}Ag. The ratio of electron capture from higher shells to K capture was determined, and found to be 0.16 ± 0.02 for ^{113}Sn and 0.26 ± 0.04 for ^{109}Cd. Internal conversion ratios are also given. (J.F.P.)

36232 ANOMALIES IN INTERNAL CONVERSION COEFFICIENTS OF E2 TRANSITIONS IN EVEN-EVEN NUCLEI. Brahmavar, S. M.; Ramaswamy, M. K. (Karnatak Univ., Dharwar, India). pp 225-35 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

Internal conversion coefficients are presented for E2 transitions in even-even nuclei. Also the ratio of the experimental to the theoretical internal conversion coefficient is plotted against the mass number for $4^+ \rightarrow 2^+$, $6^+ \rightarrow 4^+$, and $0^+ \rightarrow 2^+$, $8^+ \rightarrow 6^+$ E2 transitions. It is noted that the deviations are hard to understand in terms of any known phenomenon. (J.F.P.)

36233 DETERMINATION OF THE CONVERSION COEFFICIENT IN ^{170}Yb WITH SCINTILLATION METHODS. Jansen, J. F. W.; Wapstra, A. H. (Instituut voor Kernphysisch Onderzoek, Amsterdam). pp 237-47 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A determination was made of the K-conversion coefficient of the 84-kev transition in thulium-170 decay. The effects of backscattering are minimized by collimating the radiations into the bottom of a well-shaped crystal. The thulium spectrum measured both with a well-type and a flat crystal is shown, and the ytterbium-170 K-conversion coefficient is given. The ratio of K x rays and 88-kev gammas in ^{109}Cd was also determined. (J.F.P.)

36234 ANOMALIES OF E2 CONVERSION COEFFICIENTS IN THE DEFORMED-NUCLEUS REGION. Erman, Peter; Hultberg, Soelve (Research Inst. for Physics, Stockholm). pp 249-52 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

Four different K conversion coefficients of E2 $2^+ \rightarrow 0^+$ transitions in the deformed region were measured. These transitions were those of ^{160}Dy, ^{166}Er, ^{170}Yb, and ^{182}W. The preliminary results for the conversion coefficients are given, and the internal and external conversion lines of the 100-kev E2 transition in ^{182}W are shown. These results were obtained using a scattering correction. It is concluded that previously found anomalies may possibly not be real since corrections for the scattering effects were not made. (J.F.P.)

36235 K CONVERSION COEFFICIENT OF THE PURE E2 123-kev TRANSITION IN ^{154}Gd BY A COINCIDENCE METHOD. Zganjar, E. F.; Hamilton, J. H. (Vanderbilt Univ., Nashville). pp 253-6 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The K conversion coefficient of the pure E2, $2^+ \rightarrow 0^+$, 123-kev transition in ^{154}Gd was measured by recording the K-shell x ray and 123-kev gamma ray in a multichannel analyzer gated on coincidences between these radiations and the 1278-kev gamma which feeds the 123-kev 2^+ level. The coincidence spectrum obtained by gating on the 1278-kev gamma ray in ^{154}Gd is shown. (J.F.P.)

36236 CONVERSION COEFFICIENT MEASUREMENTS IN ^{152}Sm, ^{154}Gd, AND ^{160}Dy BY THE IEC METHOD. Jansen, J. F. W. (Instuut voor Kernphysisch Onderzoek, Amsterdam); Hamilton, J. H.; Zganjar, E. F. pp 257-61 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The K and L internal conversion coefficients of the pure E2 transitions from the first excited states in ^{152}Sm, ^{154}Gd, and ^{160}Dy and of two E2 and one E1 higher energy transitions in ^{160}Dy were measured by the internal-external conversion method. The obtained conversion coefficients and the K/L ratios of the pure E2, $2^+ \rightarrow 0^+$ transitions in ^{160}Dy, ^{152}Sm, and ^{154}Gd are listed. Also the K internal conversion line and the K external conversion line of the 86.8-kev transition in ^{160}Dy are shown. (J.F.P.)

36237 K CONVERSION COEFFICIENTS OF MIXED E2-M1 ROTATIONAL TRANSITIONS. Ashery, D.; Blaugrund, A. E.; Kalish, R. (Weizmann Inst. of Science, Rehovoth, Israel). pp 263-9 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The K conversion coefficients of the two lowest rotational transitions were measured in several odd-mass deformed nuclei in the region $153 \leq A \leq 187$. The levels were Coulomb excited by protons or alpha particles. Examples of the measured spectra are shown. The experimental and theoretical K conversion coefficients for the nuclei investigated are listed. (J.F.P.)

36238 TEST OF THE EFFECTS OF SCATTERING ON THE f FACTOR USED IN THE IEC METHOD. Zender, M. J.; Albridge, R. G. (Vanderbilt Univ., Nashville). pp 271-5 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The effects of converter thickness on measurements on the 340-, 312-, and 300-kev transitions in the beta decay ^{233}Pa $\rightarrow$ ^{233}U were investigated. The external conversion in uranium is shown for converters of 0.39 and 3.71 mg/cm^2. While the calculated f-factor drops off rapidly for thicker converters, the experimental results show a definite increase in the f factor as the converter thickness increases. This disagreement cannot be explained on the basis of experimental error. (J.F.P.)

36239 E2 CONVERSION COEFFICIENTS OF THE 245-kev TRANSITION IN ^{152}Sm AND THE 344-kev TRANSITION IN ^{152}Gd. Herickhoff, R. J.; Boyd, H. W.; Hamilton, J. H. (Vanderbilt Univ., Nashville). pp 277-84 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The K, L, and M$^+$ conversion coefficients of the $4^+ \rightarrow 2^+$ 245-kev transition in ^{152}Sm and the $2^+ \rightarrow 0^+$ 344-kev transition in ^{152}Gd were reinvestigated by the internal-external conversion method. Typical internal and external conversion lines are shown, and the conversion coefficients and f factors are listed. (J.F.P.)

36240 NUCLEAR MODELS, PARTICLE CORRELATIONS, AND INTERNAL CONVERSION COEFFICIENTS. Kisslinger, Leonard S. (Western Reserve Univ., Cleveland). pp 285-94 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The place of internal conversion coefficient measurements in the current concept of nuclear structure is reviewed to anticipate some future developments. Light, medium, and heavy nuclei are discussed. Also considered are odd-mass, odd-odd, and even-even spherical nuclei. (J.F.P.)

36241 LARGE E0-E2 MIXING OBSERVED IN ^{154}Gd. Hamilton, J. H.; Brantley, W. H.; Katoh, T.; Zganjar, E. F. (Vanderbilt Univ., Nashville). pp 297-301 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

In the investigations of the decay of ^{154}Eu to levels in ^{154}Gd the conversion coefficients of the transitions from

the 2^+ and 4^+ levels of the beta vibrational bands to the 2^+ and 4^+ members of the ground state rotational band, respectively, were measured. Internal and external conversion electron spectra are shown. The data show in an unambiguous way the presence of E0 radiation in competition with E2 radiations as predicted earlier. (J.F.P.)

36242 ANOMALOUS M1 TRANSITIONS IN ^{181}Ta AND ^{175}Lu. Seltzer, E.; Hager, R. (California Inst. of Tech., Pasadena). pp 309-13 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966. (CALT-63-19).

The two anomalous M1 transitions in ^{181}Ta and ^{175}Lu are investigated in order to determine whether the previously found discrepancies between theory and experiment are due to errors in calculation or interpolation, or are related to actual physical defects. Also the conversion coefficients and radial integrals are recalculated. (J.F.P.)

36243 ANOMALOUS E1 CONVERSION. Hager, R.; Seltzer, E. (California Inst. of Tech., Pasadena). pp 315-20 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966. (CALT-63-20).

Relative and absolute conversion electron intensities for highly hindered E1 transitions in ^{177}Hf and ^{175}Lu were measured. Using the radial integrals and wave functions the experimental results were analyzed to obtain values of λ (the ratio of the penetration matrix element to the gamma-ray matrix element). The results for the obtained conversion coefficients and ratios are listed, and values of λ are given. (J.F.P.)

36244 INTERNAL CONVERSION MEASUREMENTS OF TRANSITIONS IN ^{181}Ta. Alexander, P.; Ryde, H.; Seltzer, E. (California Inst. of Tech., Pasadena). pp 321-6 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966. (CALT-63-22).

A study is made of the conversion electron spectrum of ^{181}Ta in order to search for the transitions from the levels reported to lie above 618.9 kev and to measure selected L subshell internal conversion intensity ratios. The L subshell intensity data were employed to gain additional information on the spin of the 618.9-kev level. The energy levels of ^{181}Ta are shown, and relative intensities of conversion electron lines and M1-E2 mixing ratios of transitions in ^{181}Ta are given. From the results it is concluded that it seems probable that the 476.0-kev transition does not depopulate a level at 958 but rather originates from the 482-kev level. (J.F.P.)

36245 CONVERSION COEFFICIENT OF SOME GAMMA RAYS IN ^{113}In, ^{115}In, ^{129}Xe, AND ^{133}Xe. Jha, S. (Carnegie Inst. of Tech., Pittsburgh); Friedman, M.; Patniak, B.; Power, J. L. pp 327-31 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The conversion coefficients of some gamma rays in ^{113}In, ^{115}In, and ^{129}Xe were found using the 412-kev transition in ^{198}Hg from ^{198}Au as a standard, and the coefficient for gamma rays of ^{133}Xe was found using a ^{137}Cs source standard. The spectra are shown, and the conversion coefficients are given. (J.F.P.)

36246 ANOMALOUS E2 $\Delta K = 1$ TRANSITIONS IN THE DEFORMED REGION. Faessler, Amand (Univ., Freiberg i. B.). pp 361-6 of Internal Conversion Processes. Hamilton; Joseph H. (ed.). New York, Academic Press, 1966.

A refinement of the Nilsson model which takes into account the mixing of the single particle and the collective degrees of freedom is presented. An axially symmetric equilibrium deformation and self-consistency are assumed. (J.F.P.)

36247 PENETRATION EFFECTS ON M1 CONVERSION COEFFICIENTS AND THE CORE-EXCITATION MODEL. Lombard, R. J. (Univ., Paris, Orsay, France). pp 367-71 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The de Shalit version of the core-excitation model is improved by including shell model contributions to multiplet state wave functions or in some cases ground state correlations. The energy levels of ^{203}Tl and ^{197}Au are considered with this model. (J.F.P.)

36248 NEW CALCULATIONS OF β_4 (M SHELL) IN TELLURIUM. Bhalla, C. P. (Univ. of Alabama, Huntsville). pp 373-8 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

Numerical results are presented for the M4 transition in isomeric ^{121}Te and the basis of these calculations with relevant interpretation is described. The calculated binding energies and the internal conversion coefficients for ^{121m}Te are given. (J.F.P.)

36249 INTERNAL CONVERSION OF HIGH MULTIPOLE ORDER γ-TRANSITIONS. Geiger, J. S. (Atomic Energy of Canada Ltd., Chalk River, Ont.). pp 379-92 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The best experimental conversion coefficient data available is compared with theory in an attempt to assess the validity of the theory at the 3 to 5% level. It is concluded that the K conversion coefficients calculated by Rose, Sliv, and Band are accurate to 5% or better for E3 and higher multipolarity transitions. But there are discrepancies in the experimental data which may indicate the presence of systematic experimental errors as large as 5%. The theoretical L subshell conversion coefficients and intensity ratios for E3 and M4 transitions appear to be accurate to better than 10%. (J.F.P.)

36250 RELATIVE INTENSITIES OF INTERNAL CONVERSION LINES IN ^{137m}Ba AND ^{210}Bi. Velinsky, L. J. (Michigan State Univ., East Lansing. Albion Coll., Mich.); Velinsky, M. A.; Haynes, S. K. pp 393-8 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The internal conversion spectrum of ^{137m}Ba and ^{210}Bi was examined using ^{137}Cs and ^{210}Pb beta decays as respective sources. The relative intensities of the conversion lines and the internal conversion coefficients of ^{210}Bi are listed. Also the conversion spectrum of ^{210}Pb and the ratio of the empirically corrected theoretical value of the M shell internal conversion coefficient to its experimental value as a function of the transition energy are shown. (J.F.P.)

36251 GAMMA-ELECTRON DIRECTIONAL CORRELATION EXPERIMENT ON THE 356 kev → 81 kev CASCADE IN ^{133}Cs. Othaz, R. H.; Vignau, H.; Maranon, J. (Univ. of La Plata, Argentina). pp 405-13 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A measurement of the gamma-electron directional correlation for the 356-kev → 81-kev cascade was performed for the purpose of finding more information about the value of the nuclear structure effect parameter λ. A barium nitrate source was used to obtain the conversion electron and gamma spectra for ^{133}Cs. The results do not contradict a $\frac{1}{2}^+$ spin assignment for the 437-kev level and E2 multipolarity for the 356-kev transition in ^{133}Cs. Also $\lambda = 3 \pm 3$ was found as the most probable value for the nuclear structure effect parameter. (J.F.P.)

36252 INTERNAL CONVERSION COEFFICIENT OF THE 53-kev GAMMA RAY EMITTED IN THE DECAY OF ^{103}Ru. Mukerji, Ambuj; Kane, John W. Jr. (Univ. of Alabama, University). pp 419-22 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The decay scheme and gamma-gamma coincidence spectrum was obtained for ruthenium-103. From the results the 93-kev state can be assigned to angular momentum of $\frac{9}{2}^+$ or $\frac{5}{2}^+$. The $\frac{9}{2}^+$ assignment is compatible with the fact that there are no beta transitions to this level from the ground state of ^{103}Ru. Hence, this low lying state can be considered to be an intrinsic state with an orbital of $1g_{\frac{9}{2}}$. (J.F.P.)

36253 EXPERIMENTAL AND THEORETICAL PARTICLE PARAMETERS FOR L ELECTRONS. DIRECTIONAL CORRELATIONS IN ^{199}Hg AND ^{195}Pt. Thun, J. E.; Snellman, H.; Toernkvist, S.; Falk, F.; Vignau, H. (Uppsala Univ.). pp 433-44 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The 59(L_I + L_{II})-158γ correlation in ^{199}Hg was measured and the electron spectrum of the 50L lines in ^{199}Hg superimposed on the beta continuum from ^{199}Au are shown. The results for the intensity ratios and parameters are given. Also the L_I correlation in ^{195}Pt was measured from the electron capture decay of ^{195}Au. The electron spectrum of the 30L lines of ^{195}Pt is shown, and the particle parameters are given. (J.F.P.)

36254 PARTICLE PARAMETERS MEASURED IN PURE TRANSITIONS. Deutch, B. I.; Hornshoej (Univ. of Aarhus, Denmark). pp 459-72 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The E1 K particle parameter of the 272-kev transition in ^{173}Yb was measured in order to check existing calculations. The K-shell particle parameter and its corresponding K-conversion coefficients were determined. These data are discussed, and 19 independent particle parameters measured in previous experiments are listed and discussed. The L particle parameters are considered also. (J.F.P.)

36255 EXPERIMENTAL STUDIES OF DYNAMIC CONTRIBUTIONS TO E2 CONVERSION. Pettersson, B.-G.; Holmberg, L.; Gerholm T. R. (Univ., Stockholm). pp 473-7 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The method of studying internal conversion by a direct measurement of b_4 was applied to the case of the 412-kev transition in ^{198}Hg for the K-conversion coefficient. The 676 K-412γ and the 676γ-412γ angular distributions were measured, and the terms of fourth order in the Legendre expansions were determined. The conversion coefficients and particle parameters are given. (J.F.P.)

36256 K AND L SHELL PARTICLE PARAMETERS OF THE 84.2-kev E2 TRANSITION IN ^{170}Yb. Croft, W. L.; Hamilton, J. H.; Pettersson, B.-G. (Vanderbilt Univ., Nashville). pp 479-83 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

In an attempt to clarify the interpretation of the internal conversion process in the 84.2-kev $2^+ \rightarrow 0^+$ transition in ^{170}Yb, the K and L shell particle parameters for this transition were measured. Particle parameters were also obtained from an experiment similar to the beta K-conversion electron directional correlation carried out for the L conversion electron. (J.F.P.)

36257 E2, L, AND M + . . . SHELL PARTICLE PARAMETERS IN ^{154}Gd. Zganjar, E. F.; Hamilton, J. H. (Vanderbilt Univ., Nashville). pp 485-8 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The L and M + . . . shell particle parameters of the 123-kev E2 transition in ^{154}Gd were measured by comparing the gamma-gamma and corresponding gamma-conversion electron directional correlation coefficients as determined using the same source. This conversion electron spectrum is shown, and the particle parameters are listed. (J.F.P.)

36258 γ-e^- (L + M) AND γ-e^- (K) DIRECTIONAL CORRELATIONS IN ^{207}Pb. Patronis, E. T. Jr.; Wyly, L. D.; Braden, C. H. (Georgia Inst. of Tech., Atlanta). pp 495-6 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A preliminary experiment on the ^{207}Pb 1.06-Mev e^- (K)-0.570-Mev γ and the 1.06-Mev e^- (L + M)-0.570-Mev γ directional correlation are described. The conversion electron spectrum obtained from this experiment is shown. The ratio of the e^-(K)-γ anisotropy to the e^- (L + M)-γ anisotropy is found to be 1.02 ± 0.02. (J.F.P.)

36259 M1-E2 MIXING FROM L SUBSHELL CONVERSION RATIOS. Novakov, T. (Univ. of California, Berkeley). pp 497-506 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A previously performed study of the L-subshell ratios of mostly rotational M1-E2 transitions in which eight transitions were studied is considered, and the main results are presented. (J.F.P.)

36260 L SUBSHELL RATIOS IN E2 TRANSITIONS. Stepic, R.; Bogdanovic, M.; Mladjenovic, M. (Boris Kidric Inst. of Nuclear Sciences, Belgrade). pp 507-14 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The internal conversion measurements listed in Dzelepov were examined, and it was concluded that of the several thousands of L triplets measured, only a few dozens are sufficiently precise for checking the theory. These show an agreement within approximately 20 to 30%. A systematic check of L subshell ratios in the E2 transitions was begun. Eight nuclei in the region A = 152 to 192 were studied. The experimental L subshell ratios for E2 transitions are given and compared with theoretical values. (J.F.P.)

36261 L SUBSHELL MEASUREMENTS OF RETARDED DIPOLE TRANSITIONS. Herrlander, C. J. (Research Inst. for Physics, Stockholm); Ewan, G. T. pp 515-22 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A brief review of the experimental studies of nuclear penetration effects on the L-subshell conversion process is given. It is found that large conversion anomalies were observed only for E1 transitions with a hindrance factor greater than 10^5; that although K-forbiddenness may cause a very high retardation of the gamma transition, no anomalies were observed for K-forbidden transitions, and that the conversion anomaly factor decreases with decreasing gamma retardation but is not directly proportional to the gamma retardation. (J.F.P.)

36262 L SUBSHELL RATIO MEASUREMENTS FOR E2 TRANSITIONS IN ^{154}Gd, ^{170}Yb, AND ^{182}W. Brantley, W. H.; Pancholi, S. C.; Hamilton, J. H. (Vanderbilt Univ., Nashville). pp 535-9 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

An investigation was made of the first excited to ground state pure E2 transitions in ^{154}Gd, ^{170}Yb, and ^{182}W. The spectra obtained are shown, and the experimental and theoretical L subshell ratios are listed. It is found that the L_I conversion coefficients of rare-earth nuclei are 10 to 25% higher than those given by theory. (J.F.P.)

36263 L SUBSHELL RATIOS FOR E2 TRANSITIONS IN DEFORMED HEAVY ELEMENTS. Hamilton, J. H.; van Nooijen, B.; Ramayya, A. V.; Brantley, W. H. (Vanderbilt Univ., Nashville). pp 541-7 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A study of the L subshell ratios in deformed heavy elements was undertaken to help clarify the systematics of reported deviations. The L subshell ratios of the $2^+ \rightarrow 0^+$ first excited to ground state transitions of 42.9 kev in ^{240}Pu populated by the alpha decay of ^{244}Cm and of 57.0 kev in ^{228}Th populated by the alpha decay of ^{232}U are reported. The spectra are shown, and the experimental L subshell ratios for the E2 transitions are given. (J.F.P.)

36264 X-RAY YIELDS FROM K-SHELL IONIZATION BY ALPHA PARTICLES. Sharma, R. P.; Thosar, B. V.; Prasad, K. G. (Tata Inst. of Fundamental Research, Bombay). pp 549-53 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

Measurement of the characteristic K x-ray yield in Sn, Te, Ce, ^{144}Sm, ^{152}Sm, ^{154}Sm, ^{160}Gd, ^{186}W, and Pb was carried out by the bombardment of alpha particles with energies of 3 and 4 Mev. These studies provide a comparison of the K x-ray yields in atoms having spherical and

deformed nuclei. From the results it is concluded that the K-shell internal conversion process for E2 transitions remains unaffected by the nuclear deformation. (J.F.P.)

36265 VERY LOW ENERGY ISOMER IN THE DECAY OF ^{90}Mo. Cooper, J. A.; Hollander, J. M.; Rasmussen, J. O. (Univ. of California, Berkeley). pp 555-63 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A reinvestigation of ^{90}Mo was undertaken in order to resolve some inconsistencies in the decay scheme. The multipolarities of the 122- and 258-kev transitions were determined unambiguously by measurements of the L subshell ratio since these conversion ratios are very sensitive indicators of the multipolarities of transitions and were always definitive whenever the L lines could be resolved. The decay spectra and level schemes are shown. (J.F.P.)

36266 PENETRATION EFFECTS IN INTERNAL CONVERSION. Voikhanskii, M. E.; Listengarten, M. A.; Feresin, A. P. (Leningrad State Univ.). pp 581-8 of Internal Conversion Processes. Hamilton, Joseph H. (ed.) New York, Academic Press, 1966.

Asymptotic selection rules are established for the second member in the power series for penetration matrix elements in a general form for all magnetic and electric multipoles. (J.F.P.)

36267 TABLES OF THE CONVERSION MATRIX ELEMENTS AND PHASES. Band, I. M.; Listengarten, M. A.; Sliv, L. A. (Inst. of Physics and Tech., Leningrad). pp 589-602 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The matrix elements are given for E1, M1, E2, and M2 conversion in the L_I, L_{II}, and L_{III} shells for atomic numbers from Z = 49 to 69. The physical assumptions used in the calculation are the effect of finite size of the nucleus taken with a uniform volume charge distribution and with a surface distribution of transition currents, and the effect of screening following the method of Thomas-Fermi-Dirac. (J.F.P.)

36268 L SHELL PARTICLE PARAMETERS FOR ANGULAR CORRELATIONS OF CONVERSION ELECTRONS. PART I. L_1 AND L_2 SUBSHELLS. Listengarten, M. A. (Leningrad State Univ.); Band, I. M.; Zganjar, E. J.; Hamilton, J. H. pp 603-12 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

Conversion matrix elements and parameters are presented for angular correlations for values of atomic numbers from 49 to 98. (J.F.P.)

36269 L SHELL PARTICLE PARAMETERS FOR ANGULAR CORRELATIONS OF CONVERSION ELECTRONS. PART 2. L_3 SUBSHELL. Miranda, A.; Hornshoej, P.; Deutch, B. I. (Univ. of Aarhus, Denmark). pp 613-15 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

The particle parameters b_2 (L_3), which are presented, were calculated using a straightforward generalization of methods described by Rose et al. The radial matrix elements and Coulomb phases used in the computations include corrections for finite nuclear size and screening. (J.F.P.)

36270 K/L, L_1/L_2, AND L_1/L_3 CONVERSION COEFFICIENT RATIOS. Rose, M. E. (Univ. of Virginia, Charlottesville); Brantley, W. H.; Hamilton, J. H.; Ramayya, A. V. pp 616-41 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

Graphs of the K/L, L_1/L_2, and L_1/L_3 conversion coefficient ratios calculated from the tables of Rose are presented. The energy range covered is that where both K and L conversion coefficients were tabulated. (J.F.P.)

36271 CONVERSION COEFFICIENTS USEFUL AS CALIBRATION STANDARDS. van Nooijen, B.; Hamilton, J. H. (Vanderbilt Univ., Nashville). pp 642-3 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A survey was made of conversion coefficients which were accurately measured for use as calibration standards. The criteria for selection are that the conversion coefficient be determined by more than one method with consistent results, and that the transition of interest can be observed in a very simple decay with a reasonable half life. Only the α_K of the 279-kev transition in ^{203}Tl successfully meets these conditions, but a few others are considered good. Since this number of isotopes is so limited other cases which were accurately measured at least once are also listed. (J.F.P.)

Plasma Physics and Thermonuclear Processes

See also Fluid Physics and Thermodynamics

Refer also to abstracts 35981 and 36359.

36272 (AD-632670) AN EXPERIMENTAL STUDY OF RADIO-FREQUENCY PLASMOIDS. Interim Report. Miller, August; Trimmier, John R. (New Mexico State Univ., University Park). Apr. 1966. Contract Norn-3531(03). 83p. CFSTI $3.00 cy, $0.75 mn.

A description of r-f plasmoids is presented, and a summary of previous results and theories included. Investigations of r-f plasmoids utilizing ion beam experiments, metallic probe investigations, and electrode-to-wall voltage studies are examined. (B.G.D.)

36273 (AD-633653) DIFFRACTION BY A HALF PLANE IN A COMPRESSIBLE HOMOGENEOUS PLASMA. Labianca, F. M.; Felsen, L. B. (Polytechnic Inst. of Brooklyn, Farmingdale, N. Y. Graduate Center). Jan. 17, 1966. Contract AF19(628)-2357. 52p. (AFCRL-66-72; PIBMRI-1304-65). CFSTI $3.00 cy, $0.50 mn.

An exact solution, developed by means of the Wiener-Hopf technique, is given for the electromagnetic (optical) and pressure (acoustic) fields generated by a plane wave incident on a perfectly conducting half plane imbedded in a homogeneous warm plasma. From an asymptotic evaluation by the method of steepest descent, it is found that in addition to reflected optical and acoustic plane waves coupled at the boundary, and to a cylindrically spreading diffraction field appearing to emanate from the edge and penetrating both the illuminated and geometric-optical shadow regions, there exist edge diffraction effects in the form of surface waves and lateral waves. Relevant characteristics of these wave species are described and interpreted in simple physical terms via ray optical techniques. Some numerical data are also given. Although the plasma model is idealized, the results should be useful in predicting wave excitation phenomena to be associated with edge singularities. (auth)

36274 (AD-633726) RADIATION AND DIFFRACTION OF ELECTROMAGNETIC FIELDS IN ANISOTROPIC MEDIA. Rosenbaum, Shalom (Polytechnic Inst. of Brooklyn, Farmingdale, N. Y. Graduate Center). Feb. 25, 1966. Contract AF19(628)-2357. 211p. (AFCRL-66-255; PIBMRI-1320-66). CFSTI $6.00 cy, $1.25 mn.

The radiation from two-dimensional time-harmonic source distributions embedded in a transversely unbounded region filled with a uniaxially anisotropic medium is discussed. (The optic axis is permitted to be inclined at an arbitrary angle with respect to the z-direction of stratification.) The problem incorporates nonreciprocal effects with respect to the z-axis (lack of reflection symmetry) as well as mode coupling at planar discontinuities and in the source region. Three types of discontinuities are considered: perfectly conducting infinite plane, a dielectric interface, and a perfectly conducting half plane. A guided mode technique is employed for the rigorous analysis of the boundary value problems, and special attention is paid subsequently to the asymptotic (short wavelength) limit

which enables one to extract from the exact results invariant, ray-optical forms. Since the range of validity of the latter is broader than the special class of configurations from which they are derived, an extensive and direct use of ray techniques is suggested in more general anisotropic environments. Mode coupling at an interface gives rise to geometric optical (reflected and refracted) waves and also to diffracted (lateral) waves. Edge-diffraction phenomena are associated with the half plane problem. In addition to diffraction of the incident fields, one encounters also the less familiar effect wherein lateral waves are diffracted by the edge. In each instance, it is shown that the analytically obtained wave properties are in agreement with characteristics anticipated from ray optics. Important for the ray-optical interpretation are the refractive index diagrams for the regions in question which permit the prediction of the direction and sense of the energy flow (ray direction), the possibility of lateral wave excitation, etc. It is also shown that such ray-optical concepts as the generalized Fermat principle and conservation of the energy flux within the incident, reflected and refracted ray tubes remain applicable in the anisotropic environment. (auth)

36275 (AD-636160) ANALYTICAL STUDY OF THE PHYSICAL PROCESSES IN THE CATHODE REGION OF AN ARC. Lee, T. H.; Greenwood, Allan; Breingan, W. D.; Fullerton, H. P. (General Electric Co., Philadelphia, Pa. Power Transmission Div.). June 1965. Contract AF 33(657)-8206. 123p. (ARL-66-0065). CFSTI $4.00 cy, $0.75 mn.

A model for the arc between the cathode and the plasma proper was formulated. The governing equations for the different regions of the model were derived and solved numerically by a digital computer. Boundaries between regions were matched as far as possible, to give a self-consistent solution. The solutions obtained indicate that using the model, it is possible to explain electron emission, cathode drop, energy balance, ion current flow and ionization in the transition region for an arc on a refractory cathode in an argon gas. It was thought important to see how the cathode region joins to the contracted portion of the plasma. The energy balance in the contracted region was also studied by treating it as a multicomponent gas with the possibility of its not being in thermal equilibrium. The solution for this region indicates that when flow is an important factor in the energy balance at the arc boundary, there could be a considerable difference between the electron and ion temperatures at the arc boundary. It is believed that this effect must be considered in any study in the entrance region of arc plasma heaters. (auth)

36276 (BNL-10330) SHORT AND LONG WAVELENGTH DISTURBANCES OF A TWO-COMPONENT COLLISIONLESS PLASMA, WITH POLARIZATION PARALLEL TO A UNIFORM MAGNETIC FIELD. Thurber, James K. (Brookhaven National Lab., Upton, N. Y.). [1965]. Contract AT(30-2)-Gen-16. 21p. (CONF-660709-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 5th International Symposium on Rarefied Gas Dynamics, Oxford.

The dispersion relation (including the analytic continuation) for a two-component model of a collisionless nonrelativistic plasma is investigated, with an external uniform magnetic field acting on the system. The investigation is restricted to the case of longitudinal wave propagation parallel to the external magnetic field. (auth)

36277 (CLM-R-57) SOME FACTORS INFLUENCING THE CONTAINMENT OF A CUSP PLASMA. Hobbs, G. D.; Spalding, I. J. (Culham Lab., United Kingdom Atomic Energy Authority, Abingdon (England)). Mar. 1966. 19p. Dep. BIS $0.50. HMSO 2s. 6d.

A survey of some of the factors influencing the containment of a plasma in cusp geometry is presented, with particular emphasis on the effects arising from the presence of walls or plasma outside the containment volume. The effects of wall short-circuits on both the collision-free hole size and ion-ion collisional diffusion are considered. Space charge limitations of the electron thermal conduction loss are also discussed. A simple two-fluid MHD model of the SPICE II cusp compression experiment is described. Its predictions are found to agree with observation to within a factor of two, which is within the experimental uncertainty of the initial plasma conditions. (auth)

36278 (CLM-R-58) STEADY-STATE MODEL OF CUSP LOSSES. Taylor, J. B. (Culham Lab., United Kingdom Atomic Energy Authority, Abingdon (England)). Mar. 1966. 10p. Dep. BIS $0.25. HMSO 1s. 2d.

When space charge fields can be neglected the loss of charged particles from a cusped magnetic field can be calculated exactly from a steady state statistical model without any restrictive assumptions about the form of the equilibrium configuration. Losses calculated in this way represent an upper limit for the loss from a Maxwellian plasma. In a spindle shaped cusp it is found that the loss through the line (ring) cusp corresponds, as expected, to a leak whose width is approximately a Larmor radius. However a comparable loss occurs through the point cusp, where it corresponds to a leak which is much larger than a Larmor radius. This enlargement is not very important for the spindle cusp itself, which in any case has a large loss from the ring cusp, but a similar enlargement could greatly increase the end-losses from a high-β theta-pinch. (auth)

36279 (CLM-R-59) THE PHOENIX II INJECTOR AND BURIAL LINE COMMISSIONING. Hammond, D. P.; Sweetman, D. R. (Culham Lab., United Kingdom Atomic Energy Authority, Abingdon (England)). May 1966. 12p. (CONF-660530-11). Dep. BIS $0.30. HMSO 1s. 9d.

From 4th Symposium on Engineering Problems in Thermonuclear Research, Frascati, Italy.

The main requirements for the neutral particle injection system of PHOENIX II are that a low divergence, high intensity beam of neutral particles of appropriate energy be produced, and that the accompanying flow of cold gas into the plasma trapping region be reduced to the minimum. The injector and burial line components are described, and the quantities of gas evolved from various parts of the line are discussed. Measurements were made of the speed of the various pumping units, and an estimate is made of the contribution of each source of gas to the center chamber pressure. (auth)

36280 (LRP-25/66) STABILITY OF A DENSE PLASMA CONFINED BY A ROTATING MAGNETIC FIELD. Troyon, F. (Laboratoire de Recherches sur la Physique des Plasmas, Lausanne (Switzerland)). May 1966. 73p. Dep. mn.

The stability of a dense plasma (negligible skin depth) confined by a rotating magnetic field which is parallel to the surface is analyzed for plane and cylindrical geometries. This analysis culminates in an integro-differential equation for each mode of deformation. Specific properties of the plasma enter only through the normal acoustic impedance. The concept of average stability is introduced. Very general restrictions on the acoustic impedance of the plasma are introduced which allow the derivation of various stability criteria. These criteria are applied to different cases of interest. The plasma is described successively by fluid models of increasing complexity and a free particle model. Numerical estimates of the frequency needed to achieve stability for each mode are given. (auth)

36281 (LRP-26/66) CHAMP MAGNETIQUE TOURNANT A HAUTE FREQUENCE. (High-Frequency Rotating Magnetic Field). Lietti, A. (Laboratoire de Recherches sur la Physique des Plasmas, Lausanne (Switzerland)). June 1966. 15p. Dep. mn.

A device is described which produces a rotating field on the surface of a cylindrical hydrogen plasma column of 5 cm diameter and 44 cm length. The highest amplitude obtained is 1.8 kG at a frequency of 2.17 Mc. (auth)

36282 (LYCEN-6623) ETUDE D'UN PINCH DYNAMIQUE TUBULAIRE. (Study of a Tubular Dynamic Pinch). Maisonnier, Charles (Lyon Univ. (France). Institut de Physique Nucleaire). June 1966. 117p. Dep. mn.

Thesis.

It is shown that there is a critical energy for all fusion reactors without confinement or with marginal confinement and that the geometry of the crossed linear pinch seems to lead to the minimum critical energy. The dynamics of such a pinch are then studied in detail and the critical characteristics of voltage and energy of the energy source are deduced. It appears that the nonconfined machines appear technically unfeasible except perhaps in the form of microbonds. On the contrary, a marginal confinement can be attained either by the use of magnetic fields of the order of 10^7 gauss or by the use of a dense auxiliary plasma acting by inertia. An experiment was made to verify some of these theoretical deductions and to study the possibility of deducing a pinch of very low radius and high density confined by inertia. In this experiment an electrostatic injector produced a thin tubular beam of $LiAlH_4$ powder in an enclosure under vacuum. Under the influence of an intense pulsed source of electromagnetic radiations, the powder emits weakly ionized hydrogen which is radially accelerated by the beginning of the discharge of a bank of fast condensers. Approximately 1 μsec later, the remaining solid grains are vaporized and ionized furnishing thus an impure dense tubular plasma which, after acceleration by the current from the bank of condensers compresses and confines by inertia in the vicinity of the axis the hydrogen plasma previously produced. An axial magnetic field preestablished at 1000 gauss can be superimposed at will. The different measurement methods used (measurement of current and voltage, magnetic probes, ultrafast cinematography, measurements of x rays and neutrons) show that a deuterium plasma of density 2×10^{16} ions/cm^3 and temperature near 4 kev was confined by inertia for 1 μsec by cold (20 ev) dense (3×10^{18} ions/cm^3) plasma, producing 3×10^7 neutrons per discharge. (tr-auth)

36283 (N-66-17353) MEASUREMENT OF ENERGETIC TEST ELECTRON INTERACTIONS WITH A PLASMA. Smith, Michael R.; Johnson, W. Bruce (Case Inst. of Tech., Cleveland, Ohio). June 1965. 116p. (NASA-CR-70388; A-38). CFSTI $4.00 cy, $0.75 mn.

Thesis. Submitted by Michael R. Smith.

An experimental determination is made of the distribution of energy losses suffered by a beam of energetic test electrons traversing a dense high temperature plasma. The test electron energy is 3 kev and the plasma density varies from 5×10^{15} to 1×10^{16} cm^{-3} at a temperature of ~40,000°K. A collisional theory is developed through the ad hoc extension of the maximum impact parameter and agreement is found with the results of various other authors. The experimental average energy loss is larger than the theoretical prediction, indicating a minimum discrepancy of approximately an order of magnitude between theory and experiment. The experimental average energy loss and spread in energy are both found to vary proportionally to the plasma electron density. The experimental measurements do not substantiate a proposed energy gain mechanism. (auth)

36284 (NP-16152) CHARACTERISTICS OF LARGE-AMPLITUDE ALFVEN WAVES IN A LABORATORY PLASMA. Brown, I. G.; Watson-Munro, C. N. (Sydney Univ. (Australia). School of Physics). Mar. 1966. 23p. (ER-19). Dep. mn.

A study was made in a cylindrical hydrogenous laboratory plasma of a number of features of the propagation of Alfven waves whose wave magnetic field b_θ is not small compared to the static field B_0. With perturbation ratio b_θ/B_0 increasing to values as high as 1.3, the steepening of the initial sine wave into a shock front was studied, the local wave velocity was measured and found to be consistent with a velocity predicted from shock theory, the increase of hydromagnetic impedance was examined, and the change in ionized particle density following the passage of the wave was studied spectroscopically. (auth)

36285 (NP-16154) CONFERENCES ON PLASMA PHYSICS AND NUCLEAR FUSION RESEARCH. A List of Conferences and Similar Meetings of Direct Relevance to Fusion Research, With Details of Publication Where Known. Francis, L. S. (comp.) (Culham Lab., United Kingdom Atomic Energy Authority, Abingdon (England)). Mar. 1966. 28p. Dep. mn. BIS.

A list is presented of 76 conferences and similar meetings of direct relevance to fusion research. The meetings were held during 1952 through 1965. (M.O.W.)

36286 (NP-16160) A STUDY OF THE MAGNETO-KERR AND OTHER EFFECTS AT A PLASMA SURFACE. Robinson, L. C. (Sydney Univ. (Australia). School of Physics). Apr. 1966. 39p. (ER-21). Dep. mn.

The role of microwave reflection observations and particularly the magneto-microwave Kerr effect in the study of plasma surface phenomena is discussed. The method makes possible the absolute measurement of high electron surface densities in a density region not readily accessible to other experimental techniques, and it gives an indication of the collision frequency for momentum transfer. To facilitate the interpretation of measurements in terms of plasma parameters, curves are computed for a step-function plasma profile giving the dependence of reflection on surface electron density and collision frequency over a wide range of magnetic induction fields and microwave frequencies. The results are directly applicable to the three microwave frequencies commonly used in plasma physics research, viz., 10 Gc/sec, 35 Gc/sec and 120 Gc/sec. From an analysis of the dependence of the magnitudes and phases of the reflection coefficients of circularly and linearly polarized incident waves the relative value of the various possible waves and combinations of waves for plasma diagnostic experiments is assessed. The effects of variations from a step-function plasma density profile are considered. Polynomial expressions are derived giving the factor by which the amplitudes and phases of the reflection coefficients are modified when the density rises exponentially to a plateau level; this factor is computed for steep gradients. (auth)

36287 (NYO-2397-2) THE USE OF ATOMIC BEAMS AS A PROBE FOR STUDYING LOW-DENSITY PLASMAS. Final Report. Bederson, B.; Brown, H. H. (New York Univ., N. Y. Dept. of Physics). Mar. 1, 1966. Contract AT(30-1)-2397. 48p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Various phases of an experimental program to investigate the use of neutral beams as a means of studying plasmas are reported. The theory of analysis of elastic scattering of neutral beams by plasmas is discussed, which includes effects due to neutral atoms, positive ions, and electrons. An analysis of the scattered beam profile is made for models based upon both single-scattering events (atom-ion) and multiple collisions (atom-electron). The experimental work described consists of a summary of the measurements of the attenuation of a potassium beam by rare gases, as a function of the temperature of the scattering gas, similar studies for the attenuation of potassium and lithium by cesium and potassium neutral gases, and finally by essentially fully ionized cesium plasma. A description of the plasma chamber is included. Some auxiliary work on the design and performance of a fast neutral source is described. (B.G.D.)

36288 (SU-IPR-53) COMPUTER SIMULATION OF ANOMALOUS PLASMA DIFFUSION AND NUMERICAL SOLUTION OF POISSON'S EQUATION. Hockney, R. W. (Stanford Univ., Calif. Inst. for Plasma Research). May 1966. Contract AT(04-3)-326. 199p. Dep. mn. CFSTI $5.00 cy, $1.25 mn.

The diffusion of a collisionless plasma across a constant magnetic field by means of a two-dimensional Lagrangian computer model was studied. This model represents the plasma by means of approximately 1000 charged rods and calculates their motion, stepwise in time, as they move according to the laws of Newton and Maxwell. The model is quasi-electrostatic and takes 1.7 sec to perform a time-step on the IBM 7090 computer. The heart of the model is a fast, direct method, utilizing Fourier analysis, for solving Poisson's equation. (B.G.D.)

36289 (SU-IPR-76) STUDIES OF PLASMA OSCILLATIONS. Quarterly Status Report No. 26, March 1, 1966–May 31, 1966. Crawford, F. W. (Stanford Univ., Calif. Inst. for Plasma Research). June 1966. Contract AT(04-3)-326. 29p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Theoretical and experimental work on the positive column in a magnetic field has continued. Specifically, the steady-state theory, and low-frequency perturbations of it, leading to wave propagation and instabilities, were studied. Electric field measurements in plasma by electron beam probing are reported. Computations of dispersion characteristics of electron beam-plasma interactions are presented. (M.O.W.)

36290 (TID-23144) MAGNETIC FIELD TRANSPORT BY A SHOCK-PRODUCED PLASMA. Parkin, Curtis Willard (Vanderbilt Univ., Nashville, Tenn.). Jan. 1966. 49p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

Thesis.

An experiment is described in which trapping, transport, and decay of a magnetic field due to a transverse applied magnetic field-plasma flow interaction are observed. (B.G.D.)

36291 (TID-23221) THE PRODUCTION AND PROPAGATION OF PLASMOIDS IN A NON-LINEAR ALFVEN WAVE. Wells, Daniel R. (Miami Univ., Coral Gables, Fla. Dept. of Physics); Norwood, Joseph (National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center). [1962]. Contract AT(40-1)-3293. 27p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The theory of Alfvén waves is discussed for the case where the initial disturbance is large and perturbation techniques are not applicable in the solution of the Navier-Stokes equation. It is established that for this case there will be particle trapping in the wave and that fluid mass will be transported. It is further shown by means of a variational approach that structures formed in this manner represent a minimum energy configuration. The significance of these findings is discussed in terms of filamentary structures which have been observed in laboratory and ionospheric plasmas. (auth)

36292 (KFK-tr-193) UEBER DIE ERZEUGUNG EINES HEISSEN PLASMAS IN OGRA-II DURCH DIE INJEKTION VON SCHNELLEN WASSERSTOFFATOMEN IN EINE MAGNETISCHE FALLE. (On the Production of a Hot Plasma in Ogra-II by the Injection of Fast Hydrogen Atoms in a Magnetic Trap). Artemenkov, L. I.; Vasil'ev, R. P.; Galkin, J. V.; (and others). (Institut Atomnoi Energii, Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow). Translated into German by Peter Buriks (Kernforschungszentrum, Karlsruhe (West Ger.), from report CN-21/238. 30p. Dep. mn. JCL $2.60 fs, $1.10 mf.

The preliminary experimental results obtained in the production of a hot plasma in Ogra-II are described. The operation of the device is reported in some detail. Measurement results on the amplitudes and frequencies of the ion cyclotron radiation, pressure dependence of the amplitude of the ion cyclotron oscillations, the energy spectrum of fast atoms from the charge reversal of the plasma protons, dependency of the plasma parameters on the injection current, mean amplitude of the cyclotron oscillations, dependence of the current of the film detectors on the stabilizing field, and dependence of the plasma parameters on the plasma radius were illustrated and discussed. (J.S.R.)

36293 ELECTROMAGNETIC SCATTERING BY AN EXPONENTIALLY INHOMOGENEOUS PLASMA SPHERE. Bisbing, Paul E. (General Electric Co., Philadelphia). IEEE (Inst. Elec. Electron. Eng.), Trans. Antennas Propagation, AP-14: 219-24(Mar. 1966).

A mathematical analysis is given of electromagnetic wave scattering by radially inhomogeneous spherical objects. Numerical integration of the differential equations for the separated radial wave functions were carried out for the case of a plasma with an exponential electron density gradient. Results are given for parametric calculations of bistatic scattering. The back-scattering cross section of an inhomogeneous plasma sphere obeys the Rayleigh law at small ka, where k is the wave number and a is a constant characteristic of the distribution of plasma. As ka increases, the radar cross section approaches a max value. For low collision frequency this max occurs at a higher value of ka, the higher the plasma frequency; but for high collision frequency the max occurs at lower values of ka as the plasma frequency is increased. Also, the radar cross section of a particular plasma is sharply reduced at large ka, especially a high values of the plasma frequency. The shape of the bistatic scattering pattern is found to depend on the plasma frequency and the collision frequency as well as ka. The relative amount of forward scattering compared with back-scattering increases least rapidly with ka when the collision frequency is lowest and the plasma frequency is relatively high. On the other hand, the increase with ka is greatest when both the collision frequency and the plasma frequency are high. These properties are a result of the dependence of the refractive index of the plasma on these parameters. The validity of the Born approximation for under-dense plasmas and for small ka values was established for the case of backscattering cross section only. The forward scattering is not well approximated by this method, even when the electron density is one tenth of the critical value. These conclusions apply to the scattering by a plasma in which the electron density varies as $\exp(-r/a)$, where r is the distance from the origin. It is likely that similar conclusions could be formed with respect to the scattering by diffuse spherical plasmas in general. (BBB)

36294 INJECTION OF PLASMA IN CURVILINEAR MAGNETIC FIELD. Veron, D. (EURATOM-CEA, Fontenay-aux-Roses, France). J. Nucl. Energy: Pt. C, 8: 283-7(May-June 1966). (In French).

The injection of plasma into a curvilinear field was studied with respect to the effect of the polarization electric field and the purification of the injected plasma. The plasma studied was a deuterium plasma with a density of the order of 10^{12} ions cm^{-3} and a mean velocity of 10^6 cm sec^{-1}. The magnetic field used has a double curvature. No effect from an electric field normal to the plane of the curve was detected. The plasma injection in a curvilinear magnetic field is an efficient procedure for the purification of the fast portion of the plasma with respect to heavy ions. The apparatus can be used for the elimination of neutral particles insensitive to the magnetic field. The double curvature makes it possible to obtain at the output the plasma centered on the magnetic axis. (J.S.R.)

36295 CONTROLLED THERMONUCLEAR FUSION: THE STELLARATOR CONCEPT. Zemansky, G. M. (Naval Nuclear Power School, Mare Island, Calif.). Naval Eng. J., 78: No. 1, 75-85(Feb. 1966).

The basics of thermonuclear reactions are described. The history and development of stellarators are outlined. The basics of operation are discussed. (M.O.W.)

36296 EFFICIENCIES FOR PLASMA JET COLLISIONS IN A HOMOGENEOUS MAGNETIC FIELD. Evrard, P.; Jacquinot, J.; Leloup, C.; Poffe, J. P.; Waelbroeck, F. (EURATOM-CEA, Fontenay-aux-Roses, France). Nucl. Fusion, 6: 83-92(June 1966). (In French).

Collisions of plasma puffs, whose characteristics (density and velocity) vary considerably, are studied in a homogeneous longitudinal magnetic field. It is verified that the puffs meet head on. Collisions of dense ($n_i \geq 4 \cdot 10^{14}$ cm^{-3}) and relatively slow ($v_0 \geq 10^7$ cm s^{-1}) puffs are "efficient", that is, the initial kinetic energies of the puffs are converted into thermal energy of the ions in the resulting plasma. Faster and less dense puffs interact little (incomplete conversion of kinetic into thermal energy). The limit between efficient and inefficient collision corresponds to that which is expected from the test particle model. The slowing down of the puffs is thus ensured mainly by ion-ion interactions. The use of electric probes and the examination of the evolution of the plasma produced by collision show that this plasma does not exhibit any rapid radial motion. (auth)

36297 RESISTIVE INSTABILITIES IN A DIFFUSE LINEAR PINCH. Coppi, Bruno; Greene, John M.; Johnson, John L. (Princeton Univ., N. J.). Nucl. Fusion, 6: 101-17(June 1966). (MATT-326).

The effects of small electrical resistivity, viscosity, and thermal conductivity on hydromagnetic instabilities for diffuse linear pinch configurations are considered. For finite-pressure systems a higher order of equations must be solved than in previous work that was applicable to stellarator or slab geometries. A careful treatment of the problem of matching the perturbed solution across the boundaries that separate a resistive layer from outer hydromagnetic regions clarifies the relationship between resistive instabilities and the ordinary hydromagnetic instabilities that are obtained from the ideal equations. In a similar way consideration of various limiting cases brings out the connection between the different resistive modes. The manner in which thermal conductivity and viscosity assert themselves is exhibited, and for a special configuration it is shown explicitly how viscosity can exert a small stabilizing effect. Aside from this, instabilities are found whenever the pressure decrease is outward. (auth)

36298 DRIFTS AND PLASMA LOSSES IN Q DEVICES WITH CURVED MAGNETIC FIELDS: CALCULATIONS. von Goeler, S.; Smith, C. G.; D'Angelo, N. (Princeton Univ., N. J.). Nucl. Fusion, 6: 144-51(June 1966).

The conditions of toroidal equilibrium prevailing in a Q device with curved magnetic lines were analyzed from the two-fluid equations. The density profiles are calculated to second order in an expansion in reciprocal powers of the radius of curvature. The main features of the equilibrium are toroidal and $E \times B$ drifts that, to first order, give rise to shifts of the plasma column and, to second order, to plasma losses. These calculations can account for the experimental observations without invoking low-frequency "drift" waves on confinement. (auth)

36299 NUCLEAR FUSION BY MAGNETIC ACCELERATION OF A SUPERCONDUCTING SOLENOID. Winterberg, F. (Univ. of Nevada, Reno). Nucl. Fusion, 6: 152-4(June 1966).

A new approach to nuclear fusion that does not involve the stability problems of a plasma confined in a magnetic field is discussed that consists of accelerating macroscopic solid particles to high velocities and shooting them at a target of liquid or solid T-D. A magnetostatic method is described for acceleration of a single solid particle well above the critical size. (M.O.W.)

36300 PARAMETRIC EXCITATION OF TRANSVERSE WAVES IN A PLASMA. Montgomery, David (Univ. of Iowa, Iowa City); Alexeff, Igor. Phys. Fluids, 9: 1362-6(July 1966). (ORNL-P-2063).

It is shown that an externally imposed, oscillating electric field excites transverse electromagnetic waves propagating perpendicularly to it, in a cold plasma. The mechanism is closely related to the parametric excitation of longitudinal plasma oscillations recently predicted by Aliev and Silin. The problem provides an application of nonsecular perturbation methods, when the equations of motion are expanded in powers of the external electric field. Arbitrarily small perturbations which arise spontaneously in the plasma are amplified by the action of the electric field, for a certain range of the driving frequency. The growth rate of the oscillations is calculated. (auth)

36301 SHORT-CIRCUIT OF FLUTE DISTURBANCES AT A PLASMA BOUNDARY. Lehnert, B. (Royal Inst. of Tech., Stockholm). Phys. Fluids, 9: 1367-72(July 1966).

A plasma boundary is defined by magnetic field lines which are tangent to a conducting wall. For a sufficiently good contact between the outermost layers of the plasma and the wall, the boundary will become an equipotential surface. The joint effect of line-tying at the boundary and a finite ion Larmor radius then produces a stabilization of flute disturbances which is stronger than that arising from the finite Larmor radius alone. This effect is especially pronounced when the density increases steeply in a narrow boundary region and is nearly constant within the plasma interior. The present mechanism should have a marked influence on rotating plasma devices, but should hardly affect the rotational instability of theta pinches. An additional stabilization is provided by a velocity field which is sheared in the equilibrium state. (auth)

36302 EXPERIMENTAL OBSERVATIONS OF THE KADOMTSEV RESISTIVE INSTABILITY. McPherson, D. A. (Aerospace Corp., El Segundo, Calif.). Phys. Fluids, 9: 1373-9(July 1966).

The resistive instability known as the Kadomtsev current-convective instability was studied experimentally to verify the theoretical analysis. According to the theory, damping of the wave should be modified by the addition of a term, the sign of which depends upon the sign of the azimuthal wavenumber m. Data were taken to determine the dependence of this term upon electric current density, wavefrequency, resistivity gradient, and azimuthal wavenumber. In all instances the experimental observations are in agreement with theoretical prediction. In particular it was observed that azimuthal wavenumber of the enhanced wave changed sign when the resistivity gradient changed sign. This implies that the interaction is an effect of the resistivity gradient, and not some other phenomenon. (auth)

36303 MICROSCOPIC TREATMENT OF CLASSICAL CONTAINMENT IN THE STELLARATOR. Bishop, A. S.; Smith, Craig G. (Princeton Univ., N. J.). Phys. Fluids, 9: 1380-5(July 1966). (MATT-403).

Single-particle containment is investigated for the stellarator by treating the guiding-center orbits of charged particles in the presence of a radial electric field. The domain in velocity space (analogous to the loss cone of mirror devices) for which the orbits lead out of the plasma column is identified. Particle confinement as a function of field strength is presented, and an approximation of the self-consistent, equilibrium field is calculated for a uniform density plasma. The velocity distribution, truncated by the escape of particles from the loss cone, is shown to produce an axial current, both in the presence and absence of the electric field; contours of constant current density are presented for both cases. A method for treating the general case of charged particles moving at all times under the influence of self-consistent electric fields is also presented. (auth)

36304 DIFFUSION OF ANTIPARALLEL BIAS MAGNETIC FIELD DURING THE INITIAL STAGES OF A THETA PINCH. Green, T. S.; Newton, A. A. (United Kingdom Atomic Energy Authority, Berks, Eng.). Phys. Fluids, 9: 1386-8(July 1966). (CLM-P-96).

In a study of the early stages of a theta pinch in reversed bias magnetic field, it was found experimentally that some of the bias flux is lost before the start of the implosion. The loss is a consequence of the hydromagnetic expansion of plasma and trapped field that occurs while the driving field reverses polarity. The amount of diffusion depends on the magnitude of the bias field relative to a certain critical field. (auth)

36305 HARMONIC GENERATION IN AN IONIZED GAS. Desloge, Edward A.; Coleman, Donald J. Jr. (Florida State Univ., Tallahassee). Phys. Fluids, 9: 1389-93(July 1966).

The effect of collisions on harmonic generation in an ionized gas through which an electromagnetic wave is passing is considered. A set of equations is obtained from which it is possible, knowing the various collision cross sections, to obtain the dependence of the third-harmonic power generation on the molecular temperature, the magnitude of the field, the frequency of the field and the various particle densities. The analysis is valid for large and small fields, elastic and inelastic cross sections, and arbitrary degree of ionization, provided (1) the frequency of the field is much greater than both

the plasma frequency and the collision frequency for electron energy relaxation; (2) the magnitude of the electron drift velocity is small compared to the electron thermal speed; (3) the interaction of the electrons with electrons, ions, and molecules can be treated as binary collisions; (4) spatial variations in the density, drift velocity, pressure, electron temperature, electric field, etc., can be neglected; and (5) the electron density is constant in time. (auth)

36306 CUSP COMPRESSION OF COLLIDING PLASMA BLOBS. Allen, T. K.; Doble, K.; Jones, T. J. L.; Payne, R. M.; Spalding, I. J. (United Kingdom Atomic Energy Authority, Berks, Eng.). Phys. Fluids, 9: 1394-1402 (July 1966). (CLM-P-84).

A plasma formed by colliding two plasma blobs is compressed by a rising cusp field which reaches 34 kG between the coils in 15 μsec. The plasma density and temperature rise to peak values of $10^{16}/cm^3$ and 7×10^5 °K, 5 to 6 μsec after the start of the compression. The hole size measured at the ring cusp is one ion gyro-diameter wide, still an order of magnitude larger than predicted for a collision-free sheath having strong space-charge electric fields at the plasma boundary. The electron temperature is sufficiently high to ensure that the increase cannot be attributed simply to resistive diffusion. It is inferred that the measured hole size is determined either by short-circuiting of the space-charge fields at the walls or by microinstabilities in the sheath, but further experimental information is required to distinguish between these two possibilities. The measured containment time of 5–10 ion transits is consistent with that predicted using a simple two-fluid model of effusion through an ion gyro-diameter hole at the ring cusp, with a comparable loss through the spindle cusps. (auth)

36307 PLASMA DECAY TECHNIQUE TO MEASURE DENSITY IN DISCHARGE TUBES. Alexeff, Igor; Jones, W. D.; Lohr, John (Oak Ridge National Lab., Tenn.). Contract W-7405-eng-26. Phys. Fluids, 9: 1403-6(July 1966). (ORNL-P-1887).

The decay technique measures plasma density over a wide range; in particular, below 10^9 cm^{-3}, where, for discharge tubes of a few liters in volume, Langmuir probes can give ambiguous results. The method is most easily used in systems of simple geometry; for example, spheres and cylinders. The ion current to the discharge-tube wall is sampled by a negatively biased probe that forms a part of the wall. An average value for the positive charge density in the tube before turnoff is obtained by integrating the total ion current to the probe during decay, multiplying this quantity by the ratio of wall area to probe area, and dividing by the volume of the tube. An advantage of the decay technique is that the electron and the ion velocity distributions need not be known. (auth)

36308 EXPERIMENTAL OBSERVATIONS ON THE STABILITY OF PLASMA BOUNDED BY SLANTED END PLATES. Decker, John A. Jr. (Sperry Rand Research Center, Sudbury, Mass.). Phys. Fluids, 9: 1421-2(July 1966).

Experiments in the cesium plasma of the Q device have failed to find any effect on plasma stability due to the angle of a nonconducting end plate with respect to the axial magnetic field. (auth)

36309 INSTABILITY OF THREE-COMPONENT PLASMA SYSTEM. Ohnuma, Toshiro; Hatta, Yoshisuke (Tohoku Univ., Sendai). Phys. Fluids, 9: 1422-3(July 1966).

Unstable regions are determined mainly by means of a graphical analysis for three kinds of waves: electron beam-electron coupling; ion beam-electron (electron beam-ion) coupling; and ion beam-ion coupling. (auth)

36310 RELATIVISTIC CONTRIBUTION TO LANDAU DAMPING. Aaron, R. (Goddard Space Flight Center, Greenbelt, Md. Northeastern Univ., Boston); Currie, D. Phys. Fluids, 9: 1423-5(July 1966).

Using the collisionless Boltzmann equation, the asymptotic time behavior of longitudinal waves is studied in a one-dimensional plasma of relativistic electrons and stationary ions. The electron distribution function is assumed to be a perturbed Maxwell-Boltzmann distribution. (auth)

36311 MINIMUM-B PROPERTIES OF RELATIVISTIC ELECTRON COILS. Christofilos, N. (Univ. of California, Livermore). Contract W-7405-eng-48. Phys. Fluids, 9: 1425-7(July 1966). (UCRL-12455(Rev.2)).

An absolute minimum-B configuration of closed magnetic lines is made possible by placing relativistic electron coils in a toroidal geometry, creating an absolute minimum-B well. The depth of the well required for hydromagnetic stability is derived from criteria developed for vacuum minimum-B geometries. (auth)

36312 REFLECTION-ABSORPTION PROPERTIES OF WALLS AND SHEATHS IN THE PROPAGATION OF ION-ACOUSTIC WAVES. Bertotti, B.; Brambilla, M.; Sestero, A. (EURATOM-CNEN, Frascati, Italy). Phys. Fluids, 9: 1428-30(July 1966).

The Van Kampen–Case normal mode theory is applied to the solution of a boundary value problem for the propagation of ion-acoustic waves in collisionless plasmas, the boundary condition being provided by the nature of the charge sheath near the walls. (auth)

36313 MECHANISM OF RADIO-FREQUENCY-INDUCED PLASMA SHIELD PROPAGATION. Bethke, George W.; Ruess, Allen D. (General Electric Space Sciences Lab., King of Prussia, Pa.). Phys. Fluids, 9: 1430-2(July 1966).

Microwave-induced ionization wave experiments are described, leading to suggested production and propagation mechanisms. (auth)

36314 COMMENTS ON "RADIAL DISTRIBUTION FUNCTIONS IN A TWO-COMPONENT PLASMA". Schram, P. P. J. M. (Institut fuer Plasmaphysik, Munich). Phys. Fluids, 9: 1432-3(July 1966).

Corrrections are made to previous results (Phys. Fluids, 8: 1365 (1965)) on the scattering cross section for electromagnetic waves in the limit $K \to 0$ and $\theta_e/\theta_i \to \infty$. (L.B.S.)

36315 OBSERVATION OF PLASMA OSCILLATIONS. Van Hoven, Gerard (Stanford Univ., Calif.). Contract AF 49(638)-1321. Phys. Rev. Lett., 17: 169-72(July 25, 1966).

A series of experiments is reported in which electrostatic-wave propagation has been observed in an effectively uniform, collisionless, and magnetic-field-free plasma of a type which is simply produced in the laboratory. The measured ω-k relation conforms to that predicted from $\omega^2 \sim \omega_p^2 + 3\ \langle v_e^2 \rangle\ k^2$ and its more exact extensions. (M.H.R.)

36316 LANDAU WAVES: AN EXPERIMENTAL FACT. Derfler, H.; Simonen, T. C. (Stanford Univ., Calif.). Contract AF 33(615)-1504. Phys. Rev. Lett., 17: 172-5 (July 25, 1966).

Preliminary measurements of the dispersion characteristic of electrostatic waves in a one-dimensional plasma in the absence of a magnetic field are reported. The observed waves exhibit all the features of the dispersion relation for a Maxwellian plasma including Landau damping. (M.H.R.)

36317 DISPERSION OF ELECTRON PLASMA WAVES. Malmberg, J. H.; Wharton, C. B. (General Atomic Div., General Dynamics Corp., San Diego, Calif.). Contract DA-49-146-XZ-486. Phys. Rev. Lett., 17: 175-8(July 25, 1966).

An experiment is reported which is designed to measure the effect of plasma temperature on the dispersion of electron plasma waves. When the theory is modified to include the effects of finite size of the system and spatial variation in plasma density, it accurately predicts the observed dispersion. (M.H.R.)

36318 RECENT CONCEPTS ON PLASMA OPTIMAL CONTROLABILITY. II. Krzywoblocki, M. Z. v. Rev. Roum. Sci. Tech., Ser. Mecan. Appl., 11: 23-37(1966).

Variational principles and stability criteria in classical viscous and inviscid fluid dynamics are discussed. The stability is defined as the ability of flow patterns to sustain themselves against small perturbations. Also discussed are the stability criteria of an ionized medium, and a different definition of the stability of an ionized medium is proposed: all kinds of energy thermal, kinetic, stored (energy of magnetic and electric fields) reservoirs are mutually coupled through the motion and distribution of plasma particles. Such a coupling gives rise to an oscillatory or a unidirectional exchange (conversion) of energy between these reservoirs. The main concept adapted is the plasma optimal controlability. The development of the new general theory of the controlability of plasma is traced. Four possible approaches are considered: field theory, calculus of variations, optimum principle, and dynamic programming. The generalized optimum principle is emphasized, which is a development of the well-known Pontryagin max principle. In particular, controlability by means of optimum initial and boundary conditions is presented. The plasma is treated as multifluid medium. From the practical point of view, the initial temperature of the multifluid partially ionized medium may be a decisive control function to preserve a non-fully ionized plasma flow. For illustrative purposes an example is presented. The final step of its solution can be accomplished by means of the Ritz technique. (BBB)

36319 BROADENING AND SHIFT OF SPECTRA LINES IN THE PLASMA OF A GASEOUS DISCHARGE. Mazing, M. A. (Lebedev Inst. of Physics, Moscow). Trans. P. N. Lebedev Phys. Inst. (USSR) (Engl. Transl.), 15: 1-66(1962).

An investigation is made of methods and experimental conditions which would permit the basic conclusions of line broadening theory to be tested. Attention is directed to the fact that considerably more information on the process of line broadening can be obtained if the width and shift of lines is studied simultaneously. The results obtained are presented, and several aspects of line broadening theory which are directly connected with experimental investigations are briefly considered. A brief survey of previous experimental work is also presented. (J.F.P.)

36320 KINETIC THEORY OF REFLECTION OF ELECTROMAGNETIC WAVES OF A MOVING PLASMA IN PRESENCE OF A MODERATOR. Miroshnichenko, V. I. (Inst. of Physics and Tech., Academy of Sciences, Ukrainian SSR). Ukr. Fiz. Zh., 11: 451-3(Apr. 1966). (In Ukrainian).

An integral-differential equation is written for the strength of the electric field with the moving plasma as the coordinate reference point. The electric wave vector is perpendicular to the incident plane (s-polarization). The equation is derived from the Maxwell equation and the kinetic distribution of velocities. The equation is solved for the mirror reflection of electrons from the plasma boundary. An expression is obtained for the Fourier component of the field at the boundary. Then it is easy to obtain an expression for the surface impedance. The coefficient for the reflection of electromagnetic waves from the moving plasma is related in a simple fashion to the surface impedance. (TTT)

36321 PROBLEMS OF PLASMA PHYSICS. Kelbg, Guenter (Univ., Rostock, Ger.). Wiss. Z. Univ. Rostock, Math. Naturwiss. Reihe, 14: 277-80(1965). (In German).

A brief survey of the historical development of plasma physics is presented. The early history of studies with electric charges in gases in the nineteenth century is recapitulated. Recent development in the USSR allowing the attainment of plasma temperatures of 40×10^6 °C for periods up to 10^{-2} sec at particle density of $10^{10}/cm^3$ is mentioned. Aggregation states of matter are discussed, in terms of a hierarchy of bonding types which hold matter together. Several of the more important processes occurring in a plasma are outlined: ionization, excitation, emission, two- and three-body collisions; and natural conditions where the plasma state is found are enumerated. Several descriptive models of the plasma state are listed: the one-particle model, the fluid model, and the point charge statistical model. Theory of irreversible and reversible processes and the major problems in each class are outlined. Elements such as the molecular partition function and correlation function and parameters, particularly the radius of the Debye correlation sphere and the Langmuir frequency, are touched upon. (BBB)

36322 MEASURING THE VELOCITY OF AN ELECTRICALLY CONDUCTING MEDIUM. Burkhardt, H.; Schnell, G. (Technische Hochschule, Stuttgart). Z. Naturforsch., 21a: 485-7(Apr. 1966). (In German).

Approximation equations were derived for the voltage of a plane and a cylindrical MHD channel for the measurement of the velocity of electrically conducting media. Measurements were carried out on plasma simulators for both devices and the results were compared with the approximation values. The results showed that the method permits the measurement of the velocity averaged over the cross section at known electric conductivities. (J.S.R.)

36323 USE OF BROADENING AND DISPLACEMENT OF CESIUM SPECTRAL LINES FOR DETERMINATION OF CONCENTRATIONS OF CHARGED AND NEUTRAL ATOMS IN d-c ARC PLASMA CONDITIONS. Grechikhin, L. I.; Skutov, D. K. Zh. Prikl. Spektrosk., Akad. Nauk BSSR, 4: 381-8(May 1966). (In Russian).

A refined calculation of Stark constants was made and the limits of measurements of charged particles concentration using different lines were determined. Experimental contours of a number of cesium spectral lines were obtained. Concentrations of charged particles and neutral atoms in the d-c arc plasma were calculated. (auth)

36324 ELECTRON-TEMPERATURE PLASMA MEASUREMENTS BY SCATTERING OF LASER RADIATION. Besshaposhnikov, A. A.; Voloshin, A. E.; Kuchuberiya, I. Kh.; Simonova, N. V. Zh. Prikl. Spektrosk., Akad. Nauk BSSR, 4: 458-9(May 1966). (In Russian).

The electron component temperature measurements of the r-f pulse plasma were carried out by scattering of laser radiation. The measurement circuit is described and the scattered radiation contour measured point by point is given. (auth)

36325 OSCILLATION SPECTRA OF A WEAKLY TURBULENT PLASMA. Liperovskii, V. A.; Tsytovich, V. N. (Lebedev Inst. of Physics, Moscow). Zh. Tekh. Fiz., 36: 575-87(Apr. 1966). (In Russian).

The stability of quasistationary states of different types with respect to excitation of slow plasma oscillations (which are called second sound) are discussed, and the spectra of the second sound waves are defined. The calculations are based on equations that describe the effects of the nonlinear interaction of the waves in the plasma and in which spontaneous effects are neglected in comparison with induced effects. Dispersion equations are derived for second sound in different quasistationary states, and conditions for the stability of the states are given. It is shown that the quasistationary state, which arises from nonlinear scattering on plasma ions of ionic sound generated by an electric current in a plasma, can be unstable with respect to the excitation of second sound and that the quasistationary states associated with decay of transverse waves into longitudinal waves and of longitudinal waves into sound can be stable. The one-dimensional quasistationary state associated with decay of longitudinal waves into sound is found to remain stable in the presence of three-dimensional perturbations. (ATD)

36326 CHERENKOV EXCITATION OF ION STREAM OSCILLATIONS OF A CHARGE MOVING IN A COLD MAGNETOACTIVE PLASMA. Kurdyumov, V. N. Zh. Tekh. Fiz., 36: 588-94(Apr. 1966). (In Russian).

The effects of ion motion on the spectral region and energy density of the Cherenkov radiation of a charged particle moving parallel to a magnetic field in a plasma are investigated. It is shown that ion motions are significant at frequencies around the Larmor frequency and that their influence is predominant when the ion Larmor

frequency approaches the plasma frequency. The critical velocities of the particle for the radiation of different types of waves are calculated. (G.O.Y.)

36327 INVESTIGATION OF INJECTION AND CAPTURE OF CHARGED PARTICLES IN A MAGNETIC MIRROR TRAP. Akshanov, B. S.; Volkolupov, Yu. Ya.; Sinel'nikov, K. D. Zh. Tekh. Fiz., 36: 595-602(Apr. 1966). (In Russian).

The results of an investigation of the injection of spiral electron beams into a magnetic mirror trap are presented. A long-lived (up to 0.1 sec) plasma was obtained after injection cutoff, which contained 150-kev electrons and 250-ev ions with a charged particle density as high as 10^{12} cm^{-3}. The energy of the electron beam injected varied from 2 to 5 kev. (G.O.Y.)

36328 CHARGED PARTICLE CAPTURE DURING PULSE INJECTION INTO A TRAP WITH STATIONARY FIELDS. Akshanov, B. S.; Volkolupov, Yu, Ya.; Sinel'nikov, K. D. Zh. Tekh. Fiz., 36: 603-7(Apr. 1966). (In Russian).

The results of an investigation of the injection of sawtooth and sinusoidal electron pulses into a magnetic mirror trap are summarized. The plasmas obtained by pulse injection were very similar to those obtained by continuous injection. (G.O.Y.)

36329 ENERGY DISTRIBUTION OF CHARGED PARTICLES IN A MAGNETIC TRAP. Akshanov, B. S.; Volkolupov, Yu. Ya.; Sinel'nikov, K. D. Zh. Tekh. Fiz., 36: 608-11(Apr. 1966). (In Russian).

The energy distributions of charged particles escaping from a magnetic mirror trap were measured by using an electrostatic analyzer and ion scintillation detectors containing Al absorbers. Electrons with energies up to 100 kev and ions with energies above 250 ev were observed. It was found that higher energy electrons remained trapped longer than lower energy electrons. The plasma was found by trapping a 5-kev helical electron beam. (G.O.Y.)

36330 HIGH-FREQUENCY HEATING OF A HIGH-DENSITY PLASMA. Nazarov, N. I.; Ermakov, A. I.; Tolok, V. T. Zh. Tekh. Fiz., 36: 612-19(Apr. 1966). (In Russian).

The heating of H plasmas by ion-cyclotron and fast magnetic sound waves was investigated at pressures between 0.001 and 0.004 mm Hg. Mean longitudinal ion energies up to 2000 ev were observed in plasmas heated at the ion-cyclotron resonance. The electron temperature was only 20–30 ev. The charged particle densities were not less than 10^{13} cm^{-3}. (G.O.Y.)

36331 MEASUREMENT OF THE ELECTRON TEMPERATURE OF A PLASMA WITH THE AID OF SOFT X-RAY BREMSSTRAHLUNG. Aleksin, V. F.; Suprunenko, V. A.; Sukhomlin, E. A.; Reva, N. I. Zh. Tekh. Fiz., 36: 620-6(Apr. 1966). (In Russian).

The determination of the electron temperature of a plasma by measuring the absorption curves of the soft x-ray bremsstrahlung from targets located within the plasma is discussed. The x-ray absorption curves are converted to electron temperatures, and the principal results are tabulated. The proper selection of target and absorber materials is discussed; the significant factor is the location in the spectrum of characteristic radiations and absorption edges. The electron temperature in a magnetic field-stabilized linear hydrogen gas discharge was measured using a 40 micron Be foil target with Be and Al absorbers. The electron temperature was determined by comparing the observed absorption curves with calculated curves for different temperatures. The shapes of the observed and calculated curves were in good agreement, indicating that the electron distribution was close to Maxwellian. Both absorption curves gave the same electron temperature of slightly below 3 kev. (G.O.Y.)

36332 NONLINEAR THEORY OF INSTABILITIES OF A PLASMA IN A STRONG ELECTRIC FIELD. Shevchenko, V. I. Zh. Tekh. Fiz., 36: 627-39(Apr. 1966). (In Russian).

The unstable electrostatic and electromagnetic oscillations of an approximately uniform plasma in a strong electric field that can not be stabilized by applying a strong magnetic field are discussed. The linear theory of the oscillations is given first. Thermal motions are neglected and the electrons are assumed to move with respect to the ions with the velocity $u = \beta c$ in the direction of an external magnetic field, which is of sufficient strength that $f^2 \ll F^2(1-\beta^2)$, where f and F are the electron Langmuir and Larmor frequencies, respectively. The dispersion equation is written, and its solutions are discussed for resonance conditions when ku is approximately equal to $f(1-\beta^2)^{\frac{1}{2}} \cos\theta$ or to $F(1-\beta^2)^{\frac{1}{2}}$, where k is the component of the wave vector in the direction of the electron motion and θ is the angle between the wave vector and the direction of the magnetic field. Stability conditions are derived, as well as expressions for the logarithmic increment of the unstable oscillations. Nonlinear effects quadratic in the amplitudes are then discussed, using a moment technique. The retarding forces on the moving electrons due to the different oscillations are calculated. The principal retarding force is associated with excitation of almost longitudinal oscillations, except at ultrarelativistic velocities or in very strong magnetic fields when transverse oscillations predominate. In the case of a plasma of density 10^{10} cm^{-3} and temperature 10^5 °K in a 3-kOe magnetic and 300 v/cm electric fields, the retarding force is due to excitation of almost longitudinal oscillations, but the retarding force becomes equal to the accelerating force only when the electron velocity is such that its total energy is five times its rest energy. (ATD)

36333 MEASUREMENT OF RECOMBINATION COEFFICIENT OF XENON IN DECAYING PLASMAS. Brodskii, V. B.; Zagik, S. E.; Lyutomskii, V. A. Zh. Tekh. Fiz., 36: 640-2(Apr. 1966). (In Russian).

The recombination coefficient of xenon was measured at pressures from 20 to 600 mm Hg by following the decay of plasmas produced in a glass vessel by gamma rays from 5-μsec pulses of 1-Mev electrons on a lead target. The plasma decay was observed with a 10^9 Hz klystron-type microwave resonator made of thin wires and mounted within the vessel. (G.O.Y.)

36334 MECHANICAL EFFECTS IN A POINT TO PLANE CORONA DISCHARGE. Prokopovich, L. I. (Belorussian State Univ.). Zh. Tekh. Fiz., 36: 643-5(Apr. 1966). (In Russian).

The forces on the electrodes in point-to-plane corona discharges were measured at gap lengths from 3 to 10 cm, air pressures from 0.8 to 2.8 atm, and potentials from about 4 to 9 kv. The force F on the point electrode was found to be given by $F = A(p + B)U^{0.5}(U - U_c)$, where U is the potential on the electrodes and p is presumably the air pressure. U_c is the critical voltage defined by the current-voltage characteristic of the corona discharge. (ATD)

36335 MEASUREMENT OF PLASMA DENSITY IN A METAL CHAMBER BY EXCITATION OF HIGH MODE OSCILLATIONS. Akulina, D. K. Zh. Tekh. Fiz., 36: 646-52(Apr. 1966). (In Russian).

The densities of decaying plasmas in a large metallic toroidal chamber were measured by observing the shift of the high-mode resonant frequencies of the chamber, regarded as a cavity resonator. Plasma was produced in the chamber by several Bostick-type guns, and there was a longitudinal magnetic field of 2 to 6 kOe. The toroidal chamber was excited in the 8 mm wavelength region by a klystron oscillator whose frequency could be varied over a range of 40 MHz. The klystron was coupled to the toroidal chamber by a nonconfocal open resonator of the Fabry-Perot type. Power from the klystron, modulated at 460 kHz, was fed to one of the reflectors of the open resonator, and the signal to the other reflector was rectified, amplified, and displayed on an oscilloscope. The resonance curve of the empty toroidal chamber was recorded over a frequency interval of 40 MHz; there were 7 peaks in this

frequency range. During a plasma decay measurement the klystron frequency was held constant at a value corresponding to a recognizable feature of the empty chamber resonance curve, and the oscilloscope trace showed a number of maxima and minima due to shift of the resonance curve because of the presence of the plasma. Plasma densities from about 6×10^{10} to 10^9 cm^{-3} were recorded both with the microwave resonance technique and with a probe. The two methods gave concordant results for high-density plasmas and in weak magnetic fields. The resonant modes and the form factor of a toroidal resonator are discussed briefly. (G.O.Y.)

36336 IGNITION OF DISCHARGE IN A HIGH VACUUM PENNING CELL. Reikhrudel', E. M.; Isakaev, E. Kh. (Moscow State Univ.). Zh. Tekh. Fiz., 36: 653-60(Apr. 1966). (In Russian).

The magnetic field strength at ignition was calculated as a function of the anode potential by using the Townsend avalanche theory. Various ignition curves, previously recorded with Penning cells of different designs, are compared in detail with the predictions of the theoretical calculation. It is shown that the theoretical formula, provides a qualitative explanation for a number of features of the experimental curves. (G.O.Y.)

36337 MEASUREMENT OF THE ATTACHMENT COEFFICIENT OF THERMAL ELECTRONS IN OXYGEN AND AIR. Brodskii, V. B.; Zagik, S. E. Zh. Tekh. Fiz., 36: 672-8(Apr. 1966). (In Russian).

The attachment coefficients of electrons in oxygen at 3 to 30 mm Hg and in air at 15 to 150 mm Hg were measured by following the decay of room-temperature plasmas by a microwave technique. The plasmas were produced in a section of waveguide by 5 μsec pulses of 1-Mev electrons. H_{11} waves at 10^9 Hz were excited at one end of the waveguide section; and from their attenuation while traversing the waveguide, the electron concentration was calculated. Beginning of the measurements was delayed for a suitable time after termination of the electron pulse to permit thermalization of the electrons. The thermalization of the electrons and the contribution of other processes than attachment to the change of the electron concentration are discussed in detail. It is concluded that under the conditions of the experiment the change of the electron concentration during decay of the plasmas was due practically entirely to attachment. The attachment coefficients increased less rapidly than linearly with increasing pressure from about 4×10^{-13} cm^3/sec at the low-pressure end of the pressure range investigated to about 12×10^{-13} cm^3/sec at the high-pressure end of the range. The attachment coefficients were some 20–40% lower in oxygen than in air at pressures corresponding to the same oxygen concentration. (ATD)

36338 PROBE STUDIES OF PLASMA IN THERMIONIC CONVERTERS WITH HIGH CESIUM VAPOR PRESSURE. I. EXPERIMENTAL TECHNIQUES. THEORY. Dyuzhev, G. A.; Martsinovskii, A. M.; Moizhes, B. Ya.; Pikus, G. E.; Yur'ev, V. G. Zh. Tekh. Fiz., 36: 679-91(Apr. 1966). (In Russian).

The theory for a probe technique used to measure ion density and temperature as well as the potential distribution in the converter during both diffusion and arc operations is discussed in detail. The experimental set-up is also described. (G.O.Y.)

36339 PROBE STUDIES OF PLASMA IN THERMIONIC CONVERTERS WITH HIGH CESIUM VAPOR PRESSURE. II. VERIFICATION OF PROBE METHOD. RESULTS OF MEASUREMENTS IN DIFFUSION AND ARC OPERATIONS. Dyuzhev, G. A.; Martsinovskii, A. M.; Moizhes, B. Ya.; Pikus, G. E.; Yur'ev, V. G. Zh. Tekh. Fiz., 36: 692-703(Apr. 1966). (In Russian).

The results of a test of the probe method during investigations in dense isothermal plasmas are presented. The probe technique was used to measure the ion concentration and temperature, and the potential distribution of the converter in the diffusion and arc regions. (G.O.Y.)

36340 DISTRIBUTION OF THE RELATIVE CONCENTRATION OF ATOMS AND IONS ALONG AND ACROSS THE GAS DISCHARGE IN A SOURCE OF MULTIPLY CHARGED IONS. Kul'kina, L. P.; Pasyuk, A. S. Zh. Tekh. Fiz., 36: 726-34(Apr. 1966). (In Russian).

The density distribution of atoms and ions of Ar, Kr, and Ne were investigated in a gas discharge tube with multiply-charged ions. Optical methods were used to record the line intensities of the various discharges. It was found that the intensity distribution of all the lines due to one gas are the same, regardless of the state of ionization. The Ar discharge was examined with copper, molybdenum, and steel anticathodes. The results of these measurements indicate that the ion density is constant along the length of the tube, and that the position shifts of the inert gas ion density are caused by sputtered ions from the anticathode and cathode material. (G.O.Y.)

36341 METHOD FOR DETERMINING SOME PLASMA PARAMETERS IN A FABRY-PEROT TYPE RESONATOR. Klement'ev, V. M. Zh. Tekh. Fiz., 36: 746-8(Apr. 1966). (In Russian).

A method is presented for determining the electron concentration and rate of plasma formation in a Fabry-Perot type resonator by sucessive excitations of natural oscillations in the 8-mm range. The dimensions of the resonator are considerably larger than the wavelength, and the resonator does not have side walls. These characteristics made it possible to place large plasma formations of arbitrary shape and arbitrary transverse dimensions between the resonator reflectors. Experimental determination of the electron concentration and the rate of formation can then be made by obtaining oscillograms representing a series of resonance peaks. The number of excited oscillations in a plasma layer is determined by the number of resonance peaks, and the average rate of plasma formation is determined by the distribution of these peaks. The method can be experimentally tested by the plasma formation in a hollow cathode. In the case of pulsed operation, when both plasma formation and decay occur, it is essential that the voltage pulse duration be longer than the time of plasma formation. Either of the processes is then determined by oscillographing simultaneously the voltage pulse and signals from the resonator. (ATD)

36342 ANOMALOUS ION DIFFUSION AND HEATING IN A PLASMA COLUMN. Naida, A. P.; Soloshenko, I. A. Zh. Tekh. Fiz., 36: 749-53(Apr. 1966). (In Russian).

The diffusion of ions in a plasma column across a magnetic field was studied along with their distribution with respect to energy, as a function of hydrogen gas pressure and the magnetic field. The plasma was generated in an arc-discharge source. It was found that by reducing either the gas pressure or the magnetic-field strength below a certain critical value an unstable plasma column is obtained leading to an anomalous ion diffusion and to a sharp rise in the transverse ion temperature. It was noted that before the onset of instability, the Larmor diameter of ions was close to that of the plasma column. (G.O.Y.)

36343 MEASUREMENT OF THE ELECTRON TEMPERATURE IN A LOW-VOLTAGE CESIUM ARC. Gus'kov, Yu. K.; Kiryushchenko, A. I.; Lebedev, M. A.; Morozova, G. A. Zh. Tekh. Fiz., 36: 753-5(Apr. 1966). (In Russian).

The electron temperatures were determined in 3-amp low-voltage arcs burning in a mixture of cesium and zinc vapors in a 6 mm gap between 18 mm diameter hot stainless-steel electrodes, by measuring the intensity of the 5D recombination continuum. (G.O.Y.)

36344 ON POSSIBLE REASONS FOR THE INFLUENCE OF ELECTRODE POLARITY ON ACCELERATION OF PLASMA IN A RAIL ACCELERATOR. Kvartskhava, I. F.; Matveev, Yu. V.; Meladze, R. D.; Khautiev, E. Yu.; Reshetnyak, N. G.; Zhukov, N. N.; Sinyavskii, A. P. Zh. Tekh. Fiz., 36: 755-9(Apr. 1966). (In Russian).

It is known that the anode end of the current sheet in a rail accelerator moves with greater acceleration than does the cathode end. It is argued that this phenomenon is due

to behavior of the plasma associated with the formation of electrode spots. Examination of used electrodes has shown that both cathode and anode spots occur in rail accelerators and that the traces of the cathode spots are deeper and less continuous than those of the anode spots. It is argued that under conditions in which the plasma electrons are magnetized, the concentration of current in the vicinity of a cathode spot leads to explosive ejection of a jet of plasma from the region of the electrode. The ion motions in such a jet issuing from the cathode arc in the direction opposite to that of the discharge current in the sheet, and the Lorentz force on these moving ions thus tends to retard the motion of the cathode end of the accelerating plasmoid. Jets issuing from the anode, on the other hand, are not only less intense, but the ions in them move in the direction of the current and thus tend to enhance the acceleration of the anode end of the plasmoid. The mechanism discussed is also relevant to the motion of cathode spots in an arc discharge and is apparently associated with the end effects in a linear pinched discharge. (ATD)

36345 ON REASONS FOR THE LIMITATION OF THE VELOCITY OF PLASMOIDS IN RAIL ACCELERATORS. Kvartskhava, I. F.; Meladze, R. D.; Khautiev, E. Yu.; Reshetnyak, N. G.; Sinyavskii, A. P. Zh. Tekh. Fiz., 36: 759-62(Apr. 1966). (In Russian).

It is suggested that the reason why the velocities of plasmoids in rail accelerators are more than an order of magnitude lower than the possible stationary drift velocities in the crossed fields is that not one plasmoid, but a chain of successive plasmoids, is formed in the accelerator. Experimental data are reviewed which indicate that a number of plasmoids are in fact produced; the failure to observe multiple plasmoid production in some experiments is ascribed to the complexity of the phenomena that can arise. The mechanism of multiple plasmoid production is discussed. (ATD)

36346 CO-AXIAL MPD-ENGINE: A STATE-OF-THE-ART REVIEW. Noeske, Heinz O. (Aerospace Research Labs., [Wright-Patterson AFB, Ohio]). 47p. (CONF-660310-10). ORAU. Gmelin, AED-CONF-66-074-1.

From AII 5th Electric Propulsion Conference, San Diego, Calif.

The historical background of the co-axial MPD-engine concept was reconstructed from the available literature. Various types are being developed and tested in several laboratories of this country and abroad. A distinction has to be made between early propositions for the various accelerating mechanisms which are generally debated as possible contributors to the engine performance and the technical concepts which led to the actual devices. Claims by different teams for special acceleration mechanisms as being dominant in their device were mostly based on performance measurements as a function of various operation parameters. The argumentation power of these claims is critically evaluated. As a result it can be concluded that in contrast to the available voluminous literature, the actual operation mechanism of the MPD engine is still poorly understood. Besides other reasons, which are also discussed, the relatively small emphasis on diagnostic research, combined with the complexity of the MPD engine, accounts for this discrepancy. A general statement for the necessary conditions for the realization of extremely high exit velocities can be derived. For these extreme conditions an estimate for the obtainable highest possible velocities is presented, including the discussion of the possibility of "anomalous" exit velocities. (auth)

Shielding

36347 (DESY-66/13) MESSUNG ELEKTROMAGNETISCHER KASKADEN UND DER VON IHNEN ERZEUGTEN NEUTRONEN BEI 6,3 Gev. (Measurement of Electromagnetic Cascades and Their Production of Neutrons at 6,3 Gev). Bathow, G.; Freytag, E.; Tesch, K. (Deutsches Elektronen-Synchrotron, Hamburg (West Germany)). May 1966. 42p. Dep. mn.

The electromagnetic cascades produced by 6.3-Bev bremsstrahlung in lead, copper, and heavy concrete were measured by means of an ionization chamber. The measured transition curves are compared with existing Monte Carlo calculations. Data useful for shielding calculations are given. Neutrons produced by the cascades are measured by activation foils in several energy ranges, the results are compared with estimates. The angular distributions of the neutrons and in some cases their attenuation by the material are presented. (auth)

36348 (N-66-17566) LEWIS PROTON SHIELDING CODE. Hildebrand, R. I.; Renkel, H. E. (National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center). 1966. 89p. (NASA-TM-X-52166). CFSTI $3.00 cy, $0.75 mn.

A computer program was developed which will calculate the particle spectra and dose behind multilayer, infinite slabs of shielding from any given energy spectrum of protons impinging normally on the shield. Both spectra and dose are calculated for the incident primary protons that penetrate the shield and for the following types of secondary radiation produced in the shield: cascade protons, cascade neutrons, and evaporation neutrons. This program is written in Fortran IV for the IBM 7094 II computer. (auth)

36349 (N-66-18473) RADIATION SHIELDING FOR CENTAUR AFT BULKHEAD. Peddie, G. D. (General Dynamics/Astronautics, San Diego, Calif.). Oct. 1964. Contract NAS3-3232. 21p. (NASA-CR-54505; GD/A-AKM-64-032). CFSTI $1.00 cy, $0.50 mn.

This report describes fabrication of a lightweight radiation shield for the Centaur aft bulkhead. The assembled shield has a diameter of approximately 10 feet and is comprised of 12 gore sections. Specific characteristics required were low weight, high weight/strength ratio and good radiation qualities in specific wave length areas. This shield system was designed as an improved replacement for the existing production shield system. Specimen gore sections were successfully fabricated using a lightweight sandwich structure of two layers of four-mil thick phenolic preimpregnated glass cloth sandwiched between two one-mil thick plastics film skins. The external film is a white pigmented polyvinyl-fluoride film and the inner skin is an aluminized (both faces) polyester film. This system resulted in an improved product with a weight savings of approximately 16 lbs per missile. The cure cycle fabrication time was trimmed from 3½ hours to 1 hour. (auth)

36350 GAMMA-RAY ATTENUATION COEFFICIENTS. Davisson, C. M. pp 827-43 of Alpha-, Beta- and Gamma-Ray Spectroscopy. Vol. I. Siegbahn, Kai (ed.). Amsterdam, North-Holland Publishing Co., 1965.

Gamma-ray attenuation coefficients are tabulated for beryllium, hydrogen, nitrogen, carbon, sodium, oxygen, aluminum, magnesium, argon, silicon, calcium, potassium, copper, iron, tin, molybdenum, tungsten, iodine, lead, platinum, and uranium, and for sodium iodide, air, concrete, and water, for photon energies of 0.01 to 100 Mev. (L.B.S.)

36351 ENERGY AND ANGULAR DISTRIBUTIONS OF SHIELDED BETA RADIATION. Malevich, M. A.; Shtukkenberg, Yu. M. (Inst. of Medical Radiology, Academy of Medical Sciences, USSR). Med. Radiol., 11: No. 6, 86-9 (June 1966). (In Russian).

Angular distributions of beta particles scattered from filters of different thickness and atomic number were determined. An attempt was made to evaluate quantitatively the relation between angular distribution and filter thickness from the standpoint of resilient dispersion theory. (P.C.H.)

36352 CERTAIN CORRELATIONS CHARACTERISTIC FOR OPTIMUM COMPOSITION OF TWO-COMPONENT SHIELDING AGAINST NEUTRONS AND GAMMA RADIATION. Lisochkin, G. A. Vestsi Akad. Navuk BSSR, Ser. Fiz. Tekh. Navuk, No. 4, 11-15(1965). (In Russian).

With a neutron and gamma shielding system consisting of two material components, the total dose rate penetrating the shielding is given by the following expression: P =

$p_1 \exp(-k_1 x) + p_2 \exp(k_2 x)$. Here p_1 and p_2 are the respective dose rates from the neutron and gamma radiations. The shielding weight is $x = x_1 = -x_2$. The term $k_1 = (1/q_{11}) - (1/q_{12})$, and $k_2 = (1/q_{22}) - (1/q_{21})$. Here q_{kn} is the relaxation weight corresponding to the change in weight of component n required to change the dose by a factor of e times for the type of radiation indicated by k. The ratio of an optimum dose rate to an arbitrary dose rate P_0/P is plotted as a function of the material characteristics of a substance (k_1/k_2) and as a function of the fractional contribution (p_1/p_2) of the different types of radiation to the total dose rate. The dimensionless parameter k_1/k_2 determines the optimum gamma dose to neutron dose, and also the relative efficiency of a given composition to all others having one component in common. With uranium as the common component the values of k_1/k_2 are 6.23 for $LiBH_4$, 5.71 for lithium hydride, 5.67 for polyethylene, 4.68 for water, 2.53 for TiH_2, 2.40 for beryllium, 2.09 for boron carbide, 1.27 for concrete and 1.20 for $ZrH_{1.5}$ as the second shielding component. Values of k_1/k_2 are also given for lead and iron as the common component. (TTT)

36353 FEASIBILITY TESTS OF A RADIOISOTOPE-TYPE ABLATION-MEASURING SYSTEM. LeBel, Peter J. (Langley Research Center, Hampton, Va.). 24p. (CONF-660207–22). ORAU. Gmelin, AED-CONF-66-011-36.

From Radioisotope Applications in Aerospace Symposium, Dayton, Ohio.

The NASA-Langley Research Center is studying the feasibility of making continuous measurements of the ablation of a spacecraft heat shield through the use of radioisotopes embedded in the heat shield. The technique consists of selecting two isotopes so that the depletion rate of one will correspond to the recession of the ablating surface and the depletion of the other is a measure of ablative material decomposition. A detector system capable of differentiating between energy levels monitors radiation from each of the two isotopes. Detected counts are integrated and supplied as outputs of the system in a form compatible with the spacecraft telemetry. The results of feasibility tests with $Zr-^{95}Nb$ and ^{114m}In sources are presented and the problems encountered in incorporating radioactive compounds into ablation materials are discussed. The application of such a device in reentry vehicle systems may ultimately be limited by the characteristics of available isotopes and the suitability of existing detector systems. (auth)

Solid State Physics

See also CHEMISTRY — Inorganic and Physical Chemistry
METALS, CERAMICS, AND OTHER MATERIALS — Properties and Structure

36354 (AERE-R–4535) ANGULAR DISTRIBUTION OF NEUTRONS SCATTERED AT SMALL ANGLES BY FERROMAGNETIC SPIN WAVES. Stringfellow, M. W. (Atomic Energy Research Establishment, Harwell (England)). Mar. 1966. 46p. Dep. BIS $1.20. HMSO 6s.

The angular distribution of neutrons scattered at small angles by ferromagnetic spin waves is derived analytically for a quadratic spin wave dispersion relation $\hbar w = Dq^2$. It is shown that the distribution has a wavelength-independent cut-off angle, and that when the scattering is measured using a counter with a slit of infinite length perpendicular to the scattering plane and the specimen is magnetized first parallel and then perpendicular to the scattering angle, in a plane at right angles to the primary beam, the difference between the two distributions has a simple rectangular form. The limits of validity of the quadratic approximation are discussed, and it is shown that neglect of the dipole-dipole and magnetic field terms leads to significant error when the cut-off angle is less than 1°. When these terms are taken into account exactly the calculation cannot be treated analytically, but must be carried out numerically for given values of the primary neutron wavelength, the spin wave stiffness D, the effective magnetic field H and the magnitude and direction of the specimen magnetization M. The numerical method used is described in detail, and the angular distribution is derived for a series of wavelengths and averaged over the Maxwell spectrum for the particular case of $^{50}Fe-^{50}Ni$ alloy. It is shown that there is good agreement between the calculated and observed angular distributions for this material. Calculated angular distributions averaged over the Maxwell spectrum are given for ideal materials for three series of sets of values of D, M, and H: in each series two parameters are held constant, and the third is varied over a wide range of values in order to exhibit its effect on the characteristics of the angular distribution. Finally a graph is presented in which D is given as a function of the effective cut-off angle Θ_m, for a series of values of the saturation magnetization M, using data obtained by fitting an instrumental resolution function to computed angular distributions. This graph may be used to obtain the true value of D from experimental measurements of Θ_m in real ferromagnetic materials. (auth)

36355 (ANL–7182) USE OF NUCLEAR NULL-MATRIX IN NEUTRON-DIFFRACTION STUDIES. Sidhu, S. S.; Heaton, LeRoy; Mueller, M. H.; Campos, F. P.; Anderson, K. D.; Zauberis, D. D. (Argonne National Lab., Ill.). Mar. 1966. Contract W-31-109-eng-38. 25p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Most nuclei scatter thermal neutrons with a 180° phase change, but nine are known to scatter neutrons with a zero-degree phase change. These properties were utilized in preparing a number of nuclear null-matrices that are substitutional solid solutions or stoichiometric alloys of different elements or isotopes of the same element with close-packed hexagonal or face-centered cubic structures. The atomic percentages and the coherent nuclear-scattering amplitudes of the randomly distributed atoms of the matrix are such that the resultant scattering amplitude is zero. Consequently, the structure factor is zero and no diffraction peaks appear in the neutron pattern of the null-matrix. The compounds of the null-matrix material with light atoms, crystallizing in CaF_2-type, NaCl-type, and Mn_4N-type structures, were investigated to determine unambiguously the positions of light atoms among heavy atoms. The chemical and/or magnetic order-disorder phenomena were studied in both the null-matrix alloys and their compounds. (auth)

36356 (CEA-S–3) THE CREATION OF NEGATIVE ION VACANCIES IN ALKALI HALIDES WITH LOW ENERGY X RAY. Royce, Barrie S. H. (Princeton Univ., N. J.). 1965. 26p. Dep. mn.

In a region of x ray energies that is sufficiently low, the secondary electrons produced by the initial ionizing interaction between the x-ray photons and the host lattice, will have insufficient energy to cause the displacement of lattice ions. It is known, however, that vacancies in the negative ion sub lattice can be produced by x-ray photons below 50 kv and it is concluded that the mechanism of vacancy creation must be through the fundamental ionization process. Some experiments designed to test a specific mechanism of negative ion vacancy formation and also some experiments which attempt to further the understanding of the anticenter of the vacancy are discussed. (auth)

36357 (INR–684/II/PH) X-RAY STUDIES OF NEUTRON BOMBARDMENT INFLUENCE ON THE REAL STRUCTURE OF GERMANIUM. Auleytner, J.; Krylow, J.; Psoda, M.; Szarras, S. (Institute of Nuclear Research, Warsaw (Poland)). Jan. 1966. 10p. Dep. mn.

The dislocation distribution and density in as-grown and plastically deformed germanium single crystals before and after fast neutron bombardment dose about $2 \cdot 10^{19}$ neutrons/cm^2 were studied. An x-ray spectrometer with oscillating film was used for measurements. No changes of dislocation density in as-grown specimens were observed after irradiation. In plastically deformed crystal changes of disorientation of mosaic blocks in the range of ±1 min of arc

and the increase of dislocation density within the blocks were found. (auth)

36358 (SGAE-PH-43/1966) A HIGH-PRESSURE VESSEL FOR THE MEASUREMENT OF PRESSURE-INDUCED PHONON ENERGY SHIFTS BY INELASTIC SCATTERING OF NEUTRONS. Lechner, Ruep. (Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf). Apr. 28, 1966. 20p. Dep. mn.

A pressure vessel for neutron inelastic scattering experiments at 3000 atm maximum pressure is described. Rather thin walls with good neutron transmission properties are obtained by composing the vessel of five cylinders made of a high-strength aluminum alloy which are shrunk one upon another. This compound cylinder has a total wall-thickness of only 13.5 mm for a (cylindrical) sample volume of 30.6 mm diameter and 65 mm length. The whole range 2π of scattering angles is accessible. Certain relations are discussed which were used for calculating optimal cylinder dimensions. Experiments with a lead single crystal show a reduction of Bragg peak intensity to 76% if the crystal is mounted in the vessel. A typical measurement at 3000 atm gives an increase of 2% in phonon energy. (auth)

36359 (TID-22992) CONSOLIDATED SEMIANNUAL PROGRESS REPORT NO. 3. Covering Research Activity During the Period October 1, 1965–March 31, 1966. (University of Southern California, Los Angeles. Electronic Sciences Lab.). Contract AT(11-1)-113. 134p. Dep. mn. CFSTI $4.00 cy, $1.00 mn.

Summaries of solid state research in the areas of semiconductors, magnetism, crystals, and superconductivity are presented. Electromagnetic wave propagation in bounded, magnetized, hot plasmas, radiation and diffraction of electromagnetic waves and millimeter waves are research topics also reported. Information sciences are discussed with respect to the following: control systems, information processing and signal design theory, coding theory and automata studies, and hybrid and digital computation. (M.O.W.)

36360 (ZFK-RN-32) BILDUNG STEHENDER NEUTRONENWELLEN DURCH INTERFERENZ IN NAHEZU IDEALEN EINKRISTALLEN UND IHR EINFLUSS AUF DIE WECHSELWIRKUNG DER NEUTRONEN MIT DEN ATOMKERNEN. (Development of Standing-Neutron Waves Through Interference in Nearly Perfect Single Crystals and Their Influence on the Interaction of Neutrons With Nuclei). Sippel, Dieter (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (East Germany)). Oct. 1965. 50p. Dep. mn.

The interference phenomena of thermal neutrons were studied with respect to the effect of the abnormal absorption in the passage of neutrons through the crystal with the detection of the standing wave fields in the crystal and the quenching solution effect arising through surging phenomena in the interference of two wave fields with various large wave vectors in the center of the crystal. The conditions that must be fulfilled in order to use the dynamic theory of x-ray interference in crystals for thermal neutrons are given. Formulas of a dynamic interference theory for neutrons without consequent consideration of the incoherent scattering were derived. By double-crystal experiments with InSb crystals, the effect of the abnormal was reduced and increased absorption was observed. Therefore, the standing wave field of thermal neutrons in the crystal could be detected. It was shown that the atomic nuclei with positive scattering amplitude can scatter simultaneously thermal neutrons in interference in the ideal crystals. The deviations of the measurement curves from the calculated curves can be explained by faults of the crystal lattice. The sensitivity of the effects to the lattice defects was established. The interference of both wave fields can be detected by observation of the quenching solution of thermal neutrons. (J.S.R.)

36361 NUCLEAR EXCHANGE INTERACTIONS IN THE VICINITY OF A POINT DEFECT IN SOLID ^{3}He. Landesman, Andre (CEN, Gif-sur-Yvette, France). Compt. Rend., Ser. B, 262: 1532-5(June 13, 1966). (In French).

In solid helium-3 under certain circumstances faults are present in the vicinity of which exchange interactions are strongly increased. A calculation method is reported that makes possible the theoretical study of some of these faults. (tr-auth)

36362 DETERMINATION OF THE BURGERS VECTOR OF DISLOCATIONS IN DEFORMED URANIUM CARBIDE. Eyre, B. L.; Bartlett, A. F. (Atomic Energy Research Establishment, Harwell, Eng.). Phil. Mag., 13: 641-3 (Mar. 1966). (AERE-M-1668).

Polycrystalline arc-cast uranium carbide was strained in compression at 1410°C. After deforming, transverse slices were cut and thinned for examination in the electron microscope. The Burgers vectors of the deformation dislocations were found to be of the type $\alpha/2\langle 110\rangle$. (auth)

36363 ELECTRIC FIELD GRADIENTS IN IONIC CRYSTALS. III. NUCLEAR QUADRUPOLE RESONANCE IN THORIUM TETRACHLORIDE. Ramakrishna, J. (Andhra Univ., Waltair, India). Phil. Mag., 13: 515-19 (Mar. 1966).

The electric field gradient tensor at the chlorine site in a single crystal of thorium tetrachloride is estimated using the point charge model. This is used to calculate the resonance frequency, assuming the anti-shielding factor, and it is found that the calculated value is very much higher than the observed value. This is rather surprising in view of the highly ionic nature of the sample. These calculations indicate a large asymmetry parameter and the principal axes are found to be nearly the same as the crystalline axes. The effect of dipole polarization of the ions is taken into account in all these calculations, but the nature of the results remains unaffected. Finally, these calculations indicate a very small value for the anti-shielding factor. (auth)

36364 CORRELATION BETWEEN THE CRITICAL SHEAR STRESS OF NEUTRON IRRADIATED COPPER SINGLE CRYSTALS AND THE DENSITY OF DEFECT CLUSTERS. Makin, M. J.; Minter, F. J.; Manthorpe, S. A. (Atomic Energy Research Establishment, Harwell, Eng.). Phil. Mag., 13: 729-39(Apr. 1966). (AERE-R-5032).

An attempt was made to determine experimentally the relationship between the density of defect clusters, as observed by transmission electron microscopy, and the critical shear stress of single crystals during the annealing of neutron irradiated copper. Single crystals and foil specimens of the same purity (99.999%) were irradiated together for the same dose (2.5×10^{18} f.n.cm^{-2}) and examined after annealing for various times at 275°, 306° and 336°C. It was found that a single linear relationship existed between the critical shear stress at 4.2°K and the square root of the density of clusters less than 50 Å in diameter after anneals at all of the three temperatures. For the larger clusters, which are thought to be interstitial loops, linear relationships were not obtained and the results for the three annealing temperatures did not coincide. This work suggests that irradiation hardening is almost entirely due to the small vacancy clusters and that the average value of the resistance F_{max} of each cluster is not less than 1.25×10^{-4} dynes. It is also concluded that although clusters of different sizes are present they all have approximately the same F_{max}. (auth)

36365 MANY-BODY EFFECTS IN ELECTRON SCATTERING. Heine, V. (Cavendish Lab., Cambridge, Eng.); Nozieres, P.; Wilkins, J. W. Contract NONR 401(38). Phil. Mag., 13: 741-58(Apr. 1966).

When setting up the theory of the transport properties of metals in terms of Landau's theory of quasi-particles, it is necessary to define precisely what is the scattering amplitude of an impurity or phonon for a quasi-particle including all many-body corrections. This is done, and the definition shown to be consistent with the fundamental diagrammatic calculation of the resistivity and with the scat-

tering potential determining the shape of the Fermi surface. The limit of long wavelengths is evaluated in particular, and the results shown to be derivable also by a simple-minded application of the Landau theory. Both the coulomb repulsion and the interaction via virtual phonons are considered. In fact, all phonon effects cancel out from the resistivity and the band structure, a result depending on the special nature of the interaction which is discussed from the point of view of the Landau theory. (auth)

36366 ETCHABLE LINE DEFECTS IN CRYSTALS ARE NOT NECESSARILY DISLOCATIONS. Fleischer, R. L.; Walker, R. M. (General Electric Research and Development Center, Schenectady, N. Y.). Phil. Mag., 13: 1083-4(May 1966).

Etch pits in natural minerals can result from radiation damage tracks due to spontaneous fission of uranium-238. Observed etch pits therefore cannot be assumed to be dislocations without satisfying various criteria. (auth)

36367 INTEGRAL EQUATION FOR THE DISTRIBUTION FUNCTION OF INTERSTITIAL ATOMS OF A CASCADE PRODUCED BY IRRADIATION. Corciovei, A.; Croitoru, Marianne (Inst. of Atomic Physics, Bucharest). Rev. Roum. Phys., 11: 317-28(1966).

A method is given for obtaining the expressions for linear and quadratic averages of the end position components of a primary atom produced by irradiation. This method can also be easily extended to higher order averages. The calculation of the averages is based on the use of an integral equation for the distribution function of the end position components. This integral equation results by assuming the irradiated solid a homogeneous and isotropic medium, the interaction potential between the atoms of the lattice being a hard core one. The results thus obtained are identical with those previously derived by other authors. (auth)

36368 SURFACE EFFECTS, BAND BENDING, AND PHOTOEMISSION IN SEMICONDUCTING FILMS OF Cs_3Sb. Wooten, F. (Univ. of California, Livermore); Spicer, W. E. Surface Sci., 1: 367-77(1964). (UCRL-7645).

Measurements were made of photoemission and photovoltaic effects in thin films of p-type Cs_3Sb. The results are interpreted in terms of a band model which shows the importance of band bending at both surfaces (substrate and vacuum). Because of a decrease in effective barrier height for photoemission, caused by increased upward band bending at the substrate near the Al electrodes, enhanced photoemission is obtained in regions within ≈1 mm from the electrodes for films of thickness >300 Å. For films of thickness ≈200 Å, the increased band bending near an electrode is such as to extend completely through the film to the vacuum surface. The result is a depletion of electrons from surface states, an increase in work function, and a decrease in photoemission. Two films (200 and 300 Å thick) exhibited the characteristics of "thick" films for incident radiation with $\lambda \lesssim 6000$ Å and of "thin" films for $\lambda \gtrsim 6000$ Å. (auth)

36369 LUMINESCENCE SPECTRUM AND STRUCTURE OF A RUBIDIUM URANYL NITRATE MONOCRYSTAL. Volodko, L. V.; Komyak, A. I.; Sleptsov, L. E. Zh. Prikl. Spektrosk., Akad. Nauk BSSR, 4: 422-8(May 1966). (In Russian).

The luminescence spectrum of the $RbUO_2(NO_3)_3$ monocrystal was experimentally studied at the temperature 77°K and compared with the IR absorption spectrum. The analysis of the spectrum shows that the most of the observed lines may be interpreted as electron transitions on the vibrator sublevels of the complex ion $UO_2(NO_3)_3$. The theoretical results obtained by group theory methods confirm the initial spatial group D_{3d}^6 for this crystal. (auth)

36370 MAGNITNAYA NEITRONOGRAFIYA. (Magnetic Neutronography). Izyumov, Yu. A.; Ozerov, R. P. Moscow, Izdatel'stvo Nauka, 1966. 532p.

Magnetic neutronography is the application of magnetic neutron scattering to the study of the magnetic structure of crystals, the electron structure of atoms, and the dynamics of different magnetic types. The elementary theory of magnetic neutronography is presented along with experimental results of some investigations of the magnetic structure of the rare-earth metals; and of the electron magnetic structure of metal atoms, alloys, and chemical compounds. The chief technique used is magnetic spin excitation. 555 references. (G.O.Y.)

36371 EFFECTS OF SPIN-SPIN INTERACTIONS ON NUCLEAR ORIENTATION. McNichols, J. L. 9p. (CONF-650927-7). ORAU. Gmelin, AED-CONF-65-222-35. From American Physical Society Meeting, Honolulu, Hawaii.

A technique for calculating the effects of spin-spin interactions on nuclear orientation at very low temperatures is considered. The method of distributed local fields is applied to cobalt-60 in cerium zinc nitrate, and the angular distribution of emitted gammas is calculated and shown. (J.F.P.)

36372 SOLID STATE SESSION P-1. BOOK TWO [OF PREPRINTS OF] FIFTH RARE EARTH RESEARCH CONFERENCE, AUGUST 30-SEPTEMBER 1, 1965. 113p. (CONF-650804(Bk.2)). ORAU.

Separate abstracts are prepared for four of the ten papers presented at the solid-state session P-1. Six were previously abstracted for NSA; see 19: 33523, 37453, 40081, 20: 851, 9529, and 21414. (L.B.S.)

For abstracts of individual papers see: 35518, 35920, 36373, and 36374.

36373 MAGNETOSTRICTION IN THE HEAVY RARE EARTH METALS. DeSavage, B. F.; Clark, A. E. (Naval Ordnance Lab., White Oak, Silver Spring, Md.). pp 23-34 of Solid State Session P-1. Book Two [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

It is found that the magnetostrictive strains in single crystals of the heavy rare earth metals Tb, Dy, and Er are extraordinarily large (10^{-3} to 10^{-2}) at low temperatures. When these strains are combined group theoretically with spin-operators which transform according to the irreducible representations of the hexagonal group, it is observed that the lowest order magnetostrictive strains arise primarily from single-ion terms in the interaction hamiltonian and hence have a temperature and field dependence given by a simple function of the magnetic moment: $\lambda(T) = \lambda(0)\, \hat{I}_{\frac{1}{2}} \{L^{-1}[m(T,H)}$ Here $L^{-1}[m(T,H)]$ is the inverse Langevin function of the moment and $\hat{I}_{l+\frac{1}{2}}$ is a reduced hyperbolic Bessel function of order $l + \frac{1}{2}$, where l is the degree of the spin operators. Assuming the deformable-ion model, Tsuya, Clark, and Bozorth predict the 0°K values of these strains $\lambda(0)$ from the strained charge distribution of the conduction electrons. The extrapolated 0°K values of the shear magnetostriction, taking Dy as 100, were found to be 117, 100, 28, and -44 for Tb, Dy, Ho, and Er, respectively, which are to be compared with the theoretical estimates of 115, 100, 36, and -33. (auth)

36374 OBSERVATION OF OPTICAL ABSORPTION BANDS ASSOCIATED WITH MAGNETIC ORDER IN RARE-EARTH METALS. Schueler, C. Chr. (IBM Zurich Research Lab., Rueschlikon). pp 35-44 of Solid State Session P-1. Book Two [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

Spectroscopic studies of Gd-metal reflection methods revealed an absorption band in the infrared, centered at 0.4 ev, which appears in the ferromagnetically ordered state below 289°K. The strength of the absorption increases with increased order as the temperature is lowered. A similar band is present in Dy-metal in the spiral-phase below 178°K and persists into the ferromagnetic phase below 85°K. The nature of these extra absorptions is not yet understood. An earlier explanation on the basis of magnetic superzones present in the antiferromagnetic phases of Dy and Ho must now be abandoned, since it does not apply to ferromagnetic order. (auth)

36375 SOLID STATE SESSION P-2. BOOK FOUR [OF PREPRINTS OF] FIFTH RARE EARTH RESEARCH CONFERENCE, AUGUST 30-SEPTEMBER 1, 1965. 101p. (CONF-650804(Bk.4)). ORAU.

Ten papers are included in book four; separate abstracts were prepared for seven. Three were previously abstracted for NSA: see 19: 46994, 20: 4362, and 20: 27564. (L.B.S.)

For abstracts of individual papers see: 36131 and 36376–36381.

36376 MAGNETIC CHARACTERISTICS OF Pr COMPOUNDS HAVING THE ROCK-SALT STRUCTURE. Tsuchida, T.; Wallace, W. E. (Univ. of Pittsburgh). pp 1-8 of Solid State Session P-2. Book Four [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965. (NYO–3454-5).

The magnetic behavior of PrP, PrAs, PrSb and PrBi was investigated over the temperature range extending from 4 to 300°K. Curie-Weiss behavior is observed for all compounds in the upper portion of the temperature range studied with effective moments in fair agreement with those expected for the free tripositive ions. There is no indication of magnetic ordering; at low temperatures, however, the compounds exhibit Van Vleck (temperature-independent) paramagnetism. This is attributed to the influence of the crystal field in splitting the 9-fold degenerate ground state of the free Pr^{+3} ion. The susceptibility-temperature behavior of PrSb and PrBi can be accounted for in terms of a single parameter from which overall crystal field splittings of 157 and 140 cm^{-1}, respectively are deduced. Similar attempts for PrP and PrAs were unsuccessful. Results for the Pr compounds are in sharp contrast with those obtained for the corresponding Ce and Nd compounds. (auth)

36377 MAGNETIC PROPERTIES OF RARE-EARTH CARBIDES MC_{1-x}. Lallement, R. (Centre d'Etudes Nucleaires de Fontenay-aux-Roses, France). pp 11-18 of Solid State Session P-2. Book Four [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30–Sept. 1, 1965.

The magnetic susceptibility was measured at low temperatures of some rare-earth carbides of the MC_{1-x} type. The variation of the paramagnetic temperature θ_p with the carbon content was studied, especially for HoC_{1-x}. The analysis of these variations allowed the parameters of the function coupling magnetic ions to conduction electrons to be estimated and yielded information about the band structure of the rare-earth carbides. (auth)

36378 THE MAGNETIC SUSCEPTIBILITY OF RARE EARTH OXIDES BELOW 4.2 DEG K. Brown, R. E.; Hubbard, W. M. (Naval Ordnance Lab., Silver Spring, Md.). pp 31-42 of Solid State Session P-2. Book Four [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

The magnetic susceptibilities of the cubic sesquioxides of Yb, Tm, Er, Ho, Dy, Tb, and Gd were measured at temperatures from 1.3 to 4.2°K in applied fields ranging from a few gauss to 6 kilogauss. No evidence was found for magnetic ordering in Gd_2O_3, Dy_2O_3, or Tm_2O_3, but the effect of the crystal field on the susceptibility is prominent. The magnetic field dependence of the differential susceptibility of Er_2O_3 and Ho_2O_3 suggests that field induced rearrangements occur in the magnetic ordering. The magnetic fields required to move Néel point to zero temperature in Er_2O_3 and Tb_2O_3 were deduced to be 17 and 7 kilogauss, respectively. (auth)

36379 DIELECTRIC AND MECHANICAL LOSSES DUE TO CALCIUM-OXYGEN VACANCY PAIRS IN CERIUM DIOXIDE. Lay, K. W.; Whitmore, D. H. (Northwestern Univ., Evanston, Ill.). pp 55-66 of Solid State Session P-2. Book Four [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

Measurements of dielectric losses and internal friction in Ca-doped CeO_2 were made over the temperature range 25 to 200°C on samples with up to 2.5 percent of the Ce^{4+} ions replaced by Ca^{2+} ions. The dielectric loss measurements were made using frequencies up to 10,000 cps with the aid of a capacitance bridge, whereas the internal friction measurements were made using a low frequency (~3 to 10 cps) reed pendulum. A model was postulated to explain these observations involving oxygen vacancy-Ca^{2+} dipoles which tend to orient themselves when subjected to the alternating electric or mechanical strain field, the dipoles following the field with a certain time lag thereby giving rise to the observed relaxation losses. In this model, the loss-factor attains a maximum if the applied frequency of the field equals the jump frequency of the oxygen-ion vacancy which is constrained to eight positions at the corners of a cube surrounding a Ca^{2+} ion impurity. From the temperature dependence of the relaxation times and the peak shape, the activation energy required for such oxygen vacancy jumps is calculated to be 0.86 ev, with the pre-exponential factor estimated to be 2.4×10^{14} sec^{-1}. (auth)

36380 FLUORINE-FREE FLUX FOR GROWTH OF RARE EARTH GARNETS. Schieber, M. (Massachusetts Inst. of Tech., Cambridge). pp 79-88 of Solid State Session P-2. Book Four [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

A composition diagram which compares various mixtures used for growing rare earth garnets is described. The flux components of $PbO-B_2O_3$ or $PbO-PbF_2$ recommended for growth of either rare earth iron, gallium, or aluminium garnets are expressed in terms of a pseudo-ternary diagram. The crystals discussed are $Eu_3Fe_5O_{12}$, $Eu_3Ga_5O_{12}$, $Tm_3Al_5O_{12}$, $Tm_3Ga_5O_{12}$, $Yb_3Ga_5O_{12}$, and $Yb_3Fe_2Ga_3O_{12}$. The crystals are characterized by lattice constant, morphology, and in some cases, by magnetic susceptibility data. (auth)

36381 FERROMAGNETISM IN DILUTE SOLUTIONS OF RARE EARTHS IN PALLADIUM. Crangle, J.; Layng, R. B. (Univ., Sheffield, Eng.). pp 89-100 of Solid State Session P-2. Book Four [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

Ferromagnetic ordering occurs at low temperatures in dilute solid solutions of many of the rare earth elements in palladium, and the magnetic coupling between the rare earth local moments appears to be via polarization of the matrix. The direction of the moment associated with the matrix opposes that of the rare earth spins. New experimental data are presented on the magnetization and paramagnetic susceptibility of these alloys. (auth)

36382 SOLID STATE SESSION P-3. BOOK SIX [OF PREPRINTS OF] FIFTH RARE EARTH RESEARCH CONFERENCE, AUGUST 30-SEPTEMBER 1, 1965. 66p. (CONF-650804(Bk.6)). ORAU.

Six papers are included in book six; separate abstracts were prepared for five. One paper was previously abstracted for NSA; see 20: 21409. (L.B.S.)

For abstracts of individual papers see: 35921, 35922, and 36383–36385.

36383 SOME THEORETICAL ASPECTS OF HEAVY RARE EARTH METALS. Nagamiya, Takeo (Osaka Univ., Toyonaka, Japan). pp 5-16 of Solid State Session P-3. Book Six [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

The band structure for the conduction electrons and its consequence on the magnetic and electric properties of heavy rare earth metals are discussed. A brief description of the theory of the magnetization processes of a helical spin arrangement, in particular structure changes from helix to fan and then to ferromagnetic alignment with increasing magnetic field, is presented, the temperature being assumed to be finite and a sixfold anisotropy within the easy plane being included. Further, spin waves in a helical arrangement and in a fan arrangement are discussed; uniform modes and their frequencies are particularly considered. (auth)

36384 EXPERIMENTAL STUDY OF THE EXCITATIONS IN RARE-EARTH METALS. Mackintosh, A. R.

(Iowa State Univ., Ames). pp 17-20 of Solid State Session P-3. Book Six [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

Recent experimental developments that are of great importance in determining the thermal, transport, and magnetic properties of rare earth metals are reviewed. A direct experimental study of the Fermi surface in the rare earth metals is rendered difficult by the technical problems of preparing pure single crystals and the more fundamental difficulty that the application of a magnetic field, upon which the most successful techniques depend, may modify the magnetic structure and hence the Fermi surface itself. The study of the angular correlation of the photons emitted when positrons annihilate with the electrons is a relatively crude technique, but it does not suffer from these limitations and recent measurements on single crystals of holmium have shown clearly that the Fermi surface is highly anisotropic, in agreement with the anomalously high electronic specific heat and recent band structure calculations. It is likely that such experiments, together with calculations, will soon lead to a reasonably accurate picture of the Fermi surface. In particular, it should readily be possible to test the widely accepted hypothesis that the Fermi surfaces of all the hexagonal close packed rare earths are closely similar. The modification of the electron distribution by the magnetic ordering may be observed by this technique and also by infrared absorption measurements. Less direct information on the conduction electrons and their interaction with the spin waves is given by the study of transport properties. The temperature and magnetic field dependence of the electric resistivity support the view that the Fermi surface is anisotropic, and measurements along the c axis give an indication of the considerable modification of the electronic distribution by the superzone planes. These planes apparently affect the resistivity in the basal plane very little, so that changes which occur at magnetic transitions reflect primarily the difference in electron-magnon scattering and give some information about the spin waves. The electron-magnon interaction apparently makes a large contribution to the low temperature thermoelectric power, through the mechanism of magnon drag. Some characteristics of the spin wave spectra can also be determined from the temperature dependence of the magnetization and heat capacity. The most direct and powerful method of measuring the magnon dispersion curves is by inelastic neutron scattering, but again experimental difficulties appear in the form of the high thermal neutron capture cross section of most of the rare earths. Experiments are currently being performed on inelastic neutron scattering in terbium, however, and it seems that it should also be possible to make a detailed study of holmium. Magnetic resonance also gives directly the spin wave energies at some wave vectors and this technique should provide a valuable adjunct to neutron scattering, particularly when the latter is technically difficult. It appears that a good description of the Fermi surface and spin wave spectra of some of the rare earths will soon be available, and it will then be possible to make quantitative calculations of those physical properties which depend upon the electrons, the magnons and their interaction. (auth)

36385 THE INDIRECT EXCHANGE INTERACTION IN THE RARE EARTH METALS. Specht, Frederick (William Marsh Rice Univ., Houston, Tex.). pp 21-8 of Solid State Session P-3. Book Six [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30-Sept. 1, 1965.

An exact calculation is given for the indirect exchange interaction in the rare earth metals. With a free electron gas model for the conduction band the isotropic and first order nonisotropic terms are obtained, and it is shown that the nonisotropic term gives sizeable contributions to the interaction between two ions. An estimate is made of the contribution of the anisotropy to the crystalline exchange energy for the ferromagnetic phase. The two ferromagnetic ordering patterns with moments along the c-axis and in the hexagonal plane are considered, and an energy difference in agreement with experiment is found to be of the order of ten per cent. (auth)

36386 RENTGENOGRAFIYA MINERAL'NOGO SYR'YA. SBORNIK 5. (X-Ray Diffraction Analysis of Raw Materials. Collection 5). Sidorenko, G. A. (ed.). Moscow, Izdatel'stvo Nedra, 1966. 159p.

A separate abstract was prepared for one of the 21 papers included. The remaining papers present the results of several x-ray diffraction studies of various minerals, including those of the isomorphic series and their synthetic analogs. Special attention is paid to argillaceous minerals; the results of some crystallo-chemical investigations using advanced spectroscopic and electron-photographic techniques are presented. Some studies of crystal structure are also summarized. (G.O.Y.)

For an abstract of the individual paper see: 36387.

36387 X-RAY CHARACTERISTICS OF THE PRODUCTS OF SOLID-PHASE REACTIONS IN U_3O_8–Nb_2O_5 SYSTEM. Komkov, A. I. pp 45-8 of Rentgenografiya Mineral'nogo Syr'ya. Sidorenko, G. A. (ed.). Moscow, Izdatel'stvo Nedra, 1966. (In Russian).

Some data from the Debye powder diagrams for the high-temperature solid phases α, β, and γ of the system Nb_2O_5–U_3O_8 are presented. It was found that the crystals in the α phase (830–850°K) have a hexagonal structure, while those in the β phase (890–900°K) have a rhombic structure and those in the γ phase (1000–1050°K) have a pseudocellular structure. The parameters of each of these structures are given. (G.O.Y.)

REACTOR TECHNOLOGY

General

Refer also to abstract 36462.

36388 (AEET–248) THEORETICAL REACTOR PHYSICS STUDIES. Annual Progress Report, 1965. Rastogi, B. P. (Atomic Energy Establishment, Trombay (India)). 1966. 20p. Dep. mn.

Abstracts are given of research work completed during this period on general reactor technology, reactivity computer programs, neutron thermalization, resonance absorption, transport theory, reactor control, and nuclear data. (M.O.W.)

36389 (AEEW-R–441) SPLOSH II: A DYNAMICS PROGRAMME FOR NUCLEAR–THERMAL–HYDRODYNAMIC BEHAVIOUR OF WATER-COOLED REACTORS. Moxon, D. (Atomic Energy Establishment, Winfrith (England)). Jan. 1966. 70p. Dep. BIS $1.80. HMSO 9s.

A dynamics code is described that solves the two-group neutron diffusion equations simultaneously with the thermal and the hydraulic equations for an average channel of a water-cooled reactor. Other reactor channels can be represented as slaves, which have no feedback to the average channel. The fission power at any axial station in a slave channel is related to that in the average by prescribed time-dependent factors, and the hydraulic flow is determined from pressure-drop requirements dictated by the performance of the average channel. A finite difference model of the fuel element and can represents the behaviour of the fuel temperatures and surface heat flux. The representation of the hydraulic circuit was made sufficiently general that the code is applicable to BWR, PWR, and pressure tube reactor designs. The code can be used to study transients resulting from imposed time variations in coolant flow, inlet enthalpy, system pressure, electrical torque supplied to the circulating pumps, (or alternatively, the angular velocity of the pump rotors,) moderator height, frictional resistances simulating blockages and control rod and fuel element insertions. The harmonic response can be obtained by injecting sinusoidal time variations until the starting transient has been damped out. Output includes axial distributions of the neutron fluxes, heat flux, coolant density and temperature, burnout margin, and the fuel and can temperature in both the average and the slave channels. The code was originally written in FORTRAN II for use on the IBM 7090. Computing times vary greatly with the problem and the desired accuracy, but experience has shown that a computing time which is slower than real time by a factor thirty is adequate for a wide range of cases. The code has recently been converted to S2 and EGTRAN for use on the IBM 7030 and the English Electric Leo Marconi KDF 9 computers. (auth)

36390 (ANL–7219) REACTOR DEVELOPMENT PROGRAM PROGRESS REPORT, MAY 1966. (Argonne National Lab., Ill.). June 30, 1966. Contract W-31-109-eng-38. 99p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Separate abstracts were prepared for the four included sections. (M.O.W.)

For abstracts of individual sections see: 36391–36393 and 36525.

36391 (ANL–7219, pp 1-27) LIQUID-METAL-COOLED REACTORS. (Argonne National Lab., Ill.).

Further research developments on the EBR-II, general fast reactor physics, general fast reactor fuel development, general fast reactor fuel reprocessing development, and sodium technology are reported. (M.O.W.)

36392 (ANL–7219, pp 28-54) GENERAL REACTOR TECHNOLOGY. (Argonne National Lab., Ill.).

Further research developments are reported on experimental reactor and nuclear physics, theoretical reactor physics, instrumentation, high-temperature materials studies, other reactor fuels and materials development, engineering development, chemical separations, and the plutonium recycle experiment. (M.O.W.)

36393 (ANL–7219, pp 77-89) NUCLEAR SAFETY. (Argonne National Lab., Ill.).

Brief summaries of research progress on each of the following topics are presented: irradiated fast reactor oxide fuel pins, TREAT meltdown tests with metallic fuel in flowing sodium, fast reactor safety, containment program, chemical and associated energy-transfer problems in reactor safety, metal-water reactions, and plutonium volatility safety. (M.O.W.)

36394 (CONF-650413) NEUTRON DYNAMICS AND CONTROL. Proceedings of the Symposium on Nuclear Engineering at The University of Arizona, Tucson, April 5–7, 1965. AEC Symposium Series No. 7. (Arizona Univ., Tucson. Dept. of Nuclear Engineering. Atomic Energy Commission, Washington, D. C.). Contract AT(11-1)-676. 612p. Dep. mn. CFSTI $4.50 cy, $2.50 mn.

Separate abstracts were prepared for 16 of the 32 papers included. The remaining papers were previously abstracted in NSA (19: 17282, 21634, 21635, 21637, 25748, 25760, 29178, 33564, 38208, 41653, 41654, 42061, 42062, 42188, 45685, and 20: 1411). (G.O.Y.)

For abstracts of individual papers see: 36395–36400, 36405, 36462–36464, 36510, 36512, 36513, and 36526–36528.

36395 (CONF-650413, pp 28-37) NONLINEAR STUDY OF REACTOR SYSTEMS WITH LINEAR FEEDBACK. Akcasu, A. Ziya (Michigan Univ., Ann Arbor).

Criteria are presented for local, global, and Lagrange stability, as well as a criterion for the nonexistence of solutions with a finite escape time, in reactor systems with an arbitrary linear feedback. (auth)

36396 (CONF-650413, pp 77-87) STABILITY OF NONLINEAR COUPLED-CORE REACTORS. Murray Hugh S.; Schultz, Donald G. (Arizona Univ., Tucson).

A method is developed for investigating the asymptotic stability of coupled-core reactors by means of the second method of Liapunov. Regions of stability in the state space are obtained for a simplified nonlinear model of two coupled cores. The effect of the time delay is investigated directly using the second method without approximations for the delayed term. (auth)

36397 (CONF-650413, pp 207-24) A CLOSED-LOOP, APPROXIMATELY TIME-OPTIMAL CONTROL METHOD. Melsa, James L. (Arizona Univ., Tucson. Control Systems Lab.).

A special class of solutions of the Hamilton-Jacobi equation, called eigenvector scalar products, is used to develop a method of closed-loop, approximately time-optimal control. The method is developed first for linear systems in which the control matrix is nonsingular and then for systems in which the control matrix is singular. Finally, the extension of the method to nonlinear systems is considered (auth)

36398 (CONF-650413, pp 312-22) SPACE DEPENDENCE OF THE REACTOR-NOISE SPECTRAL-DENSITY FUNCTION. Sheff, James R.; Albrecht, Robert W. (Washington Univ., Seattle).

The spectral-density function was calculated for both critical and subcritical bare cubes of three sizes. The results are compared to the space-independent-theory prediction of the spectral density. It was found that, for detector location away from the axes of symmetry and/or for subcritical systems, the comparison between the two theories is poor. For the system sizes considered, the space-independent representation is adequate for the critical case with detector located at the cube center, but it becomes less adequate for large systems. (G.O.Y.)

36399 (CONF-650413, pp 361-70) LARGE REACTOR EXCURSIONS STARTING AT HIGH TEMPERATURE. Canosa, Jose (General Electric Co., Pleasanton, Calif. Vallecitos Atomic Lab.).

The maximum temperature reached by a reactor core in several step excursions with different Doppler reactivity feedbacks is calculated analytically with the delayed neutrons taken into account. The analytical values are compared with those obtained from a numerical solution of the kinetics equations, and it is found that the agreement is extremely good for the more severe excursions; in these cases the difference between the respective results is less than 1%. (auth)

36400 (CONF-650413, pp 371-85) TREAT EXPERIMENTS TO PROVIDE DATA FOR FAST REACTOR SAFETY KINETICS CALCULATIONS. Dickerman, C. E.; Robinson, L. E. (Argonne National Lab., Ill.).

Data developed from TREAT experiments were used to make calculations of hypothetical accidents occurring in a core similar to that of the Experimental Breeder Reactor No. II; the calculations take into account variations, over the reactor core, of power and coolant flow. These variations can account for a reduction of an order of magnitude or more in the reactivity-insertion rates estimated from the failure of a single fuel pin. From photographic experiments, significantly different modes of failure and failure thresholds were found for UO_2 specimens of fast reactor fuel size. Similar samples of US, when exposed to comparable transient conditions, demonstrated resistance to mechanical damage superior to that of the uranium oxide. These differences in behavior may be explained on the basis of physical properties. (G.O.Y.)

36401 (ORNL-3901(Pt.1)) THE ADEQUACY OF SCALE-UP IN EXPERIMENTS ON FISSION-PRODUCT BEHAVIOR IN REACTOR ACCIDENTS. PART I. AN ANALYSIS OF SCALE-UP IN THE U. S. NUCLEAR SAFETY PROGRAM. Miller, C. E. Jr.; Browning, W. E. Jr. (Oak Ridge National Lab., Tenn.). July 1966. Contract W-7405-eng-26. 57p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

A study was performed to determine whether sufficient information bearing on fundamental principles and proved out by simulation on an adequate scale, is forthcoming from currently planned experiments in the U. S. Nuclear Safety Program on the behavior of fission products in a nuclear accident. Four areas of concern in nuclear safety experimentation are discussed: (1) release of fission products from the fuel, (2) transport of fission products from the fuel to the containment vessel, (3) behavior of fission products in containment systems, and (4) behavior of fission products in gas cleaning systems. Many small-scale experiments have provided a wealth of rather detailed data on these subjects. However, the application of these data to the prediction of the consequences of a nuclear accident requires extensive extrapolation. The validity of the extrapolation must be tested by determining whether under a specified set of conditions the mechanisms which are dominant in controlling fission product behavior are the same in large- and small-scale experiments. Large-scale experiments, such as the Loss-of-Fluid Test (LOFT), are planned in which a reactor core will be destroyed and fission product behavior will be determined. These experiments, because of their size, will be complex and costly and therefore few in number, and the application of their results to conditions not tested requires interpretation based on extrapolation from smaller-scale experiments. The need is discussed for additional intermediate scale experiments which could help test the validity of the extrapolations of the results of small-scale experiments and could provide more detailed information directly applicable to the events in a real nuclear accident than would be practical using the more costly full-scale experiments. We conclude that experiments to study fission product behavior in containment and in gas cleaning systems are well scaled over the range between small laboratory experiments and LOFT. However, experiments to study the release and the transport of fission products from fuels are not well scaled. Intermediate-scale experiments of the order of 10 and 1 percent of the size of LOFT are needed. Four such experiments are suggested. (auth)

36402 NATURAL CONVECTION IN A RECTANGULAR CAVITY WITH INTERNAL HEAT GENERATION. Smith, Willy; Hammitt, Frederick G. Nucl. Sci. Eng., 25; 328-42(1966).

Applications to nuclear reactors have revived interest in natural convection. A rectangular closed cavity with internal heat generation and wall-cooling roughly simulating a channel of an internally cooled homogeneous reactor core was studied theoretically and experimentally. The basic equations of continuity, Navier-Stokes, and a modified energy relation including a volumetric heat source are normalized to show the dependence on nondimensional parameters. The complexity of these equations allows only numerical solutions, which are obtained following a modified Squire's method consisting in assuming temperature and velocity profiles. These are substituted into the nondimensional equations, and integrated across the cavity, resulting in a still complex system of differential equations in which the dependent variables and unknown functions are the thickness, velocity, and temperature of the rising core of fluid. The coefficients in the equations are functions of the core thickness, more or less complicated according to the velocity and temperature profiles assumed. Two cases are considered: a simplified temperature profile, as used by Lighthill; and a more sophisticated profile with a positive maximum. Both velocity profiles are Lighthill's. Digital computer calculations using a fourth-order Runge-Kutta method yielded solutions that follow the typical one-fourth power law: $Nu = C(m,\sigma)[(a/b)Ra]^{1/4}$, where $\frac{1}{2}m$ is the slope of the wall temperature distribution, assumed linear. To include liquid metals, C was computed for $0.01 \leq \sigma \leq 10$. The parallel experimental study confirms the existence of a positive maximum in the temperature profile, previously not reported. Introduction of this innovation in the theoretical treatment leads to excellent agreement with experimental results, and has the general effect of lowering the theoretical curves $Nu = f[\sigma,(a/b)Ra]$. Semiquantitative experimental data on the velocity field also indicate the existence of a positive maximum in the velocity profile until now not reported. (auth)

Auxiliaries and Components

Refer also to abstracts 35859 and 35566.

36403 (AAEC-TM-314) SHUTDOWN: A REACTOR SHUTDOWN OPTIMIZATION CODE. Fredsall, J. R. (Australian Atomic Energy Commission Research Establishment, Lucas Heights). Mar. 1966. 46p. Dep. mn.

The FORTRAN IV digital computer code SHUTDOWN uses a trial and error procedure to find the optimum method of altering the reactor power before shutdown for an outage of a given desired duration. Exact optimum solutions are not found by this method but the solutions that are found can be used to improve reactor operations. (auth)

36404 (AE-228) INTEGRAL PARAMETERS OF THE GENERALIZED FREQUENCY SPECTRA OF MODERATORS. Purohit, S. N. (Aktiebolaget Atomenergi, Stockholm (Sweden)). June 1966. 27p. Dep. mn.

A study of the integral quantities $-M_2$ (the second energy transfer moment of the scattering kernel weighted by the Maxwellian distribution), $(v\Sigma_s)_{min}$ (the minimum value of the scattering cross section times velocity) and the moments of frequency spectrum including the effective temperature and Debye-Waller integrals – in terms of the frequency spectrum of the dynamical modes is presented. Numerical results for H_2O, D_2O, Be, BeO, and C using the available frequency spectra were obtained. In the estimation of M_2 and $(v\Sigma_s)_{min}$ the first term of the Placzek mass expansion is obtained exactly and the correction by the Doppler approximation method. In addition, the exact re-

sults for the Doppler approximation and the gas model were also given. (auth)

36405 (CONF-650413, pp 110-36) SYNTHESIS OF AN OPTIMAL NUCLEAR REACTOR CONTROL SYSTEM. Kliger, I. (Argonne National Lab., Ill.).

The problem of optimal reactor control is formulated to include both a large number of desired output programs and dynamic behavior by the analysis of a generalized performance index, which is a measure of the deviation of the reactor power output from its desired response. The control input, which minimizes the performance index selected, can be realized as a closed-loop feedback system. The optimal control input is found by the calculation of the control law in terms of the instantaneous reactor state. (auth)

36406 (IITRI-578P21-20) STUDIES OF REACTOR CONTAINMENT. Bimonthly Progress Report, April 1 to May 31, 1966. Gallagher, E. V.; Wiedermann, A. H. (IIT Research Inst., Chicago, Ill.). Contract AT(11-1)-578. 56p. (IITRI-T6042-20). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A report is presented on coolant decompression experiments and analysis with the primary objective being to obtain data on the behavior of decompression of water in small scale-size models with obstructions to the flow which simulate the characteristics of nuclear power reactor core structures and components. (B.G.D.)

36407 (NAA-SR-Memo-8925) DOUBLE-DIAPHRAGM REACTOR SAFETY DEVICE: A SUMMARY REPORT. Springer, T. H. (Atomics International, Canoga Park, Calif.). Aug. 28, 1963. Contract AT(11-1)-Gen-8. 90p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

A report is presented on the completed work on the double diaphragm reactor safety device. The mechanism, completely independent and self-contained, has a response time of approximately 10 msec. The thermal behavior of the neutron-activated trigger and the gas dynamics were investigated. The application to low-power critical assemblies was demonstrated. (auth)

36408 (NP-16006) O METODAKH OBNARUZHENIYA RADIOIZOTOPOV V KONTURE OKHLOZHDENIYA GETEROGENNYKH REAKTOROV OKHLAZHDENNOI VODOI. (Methods for Detecting Radioisotopes in the Cooling Circuit of Water-Cooled Heterogeneous Reactors). Filin, A.; Alekseev, Z.; Ioneskii, E. (Institutul de Fizica Atomica, Academia R. P. R., Bucharest (Romania)). 1964. 13p. Dep. mn.

In distinguishing between various activities it is desirable to know the energy spectrum and half life of a radioisotope. The maximum beta energy can be determined by absorption in aluminum, and the gamma energy can be determined on a gamma scintillation counter. With a mixture of activities the harder component of the beta activities can be found more readily and accurately. The absorption in aluminum is not always strictly exponential and must be corrected with the use of the proper normalizing factor. The beta energy, half life, and gamma spectrum give sufficient information to identify a radioisotope. Further confirmation can be obtained by radiochemical analysis. Sodium, iron, and cobalt activities were separated and identified in this way. Magnesium, manganese, and chromium activities were also found. (TTT)

36409 (RISO-123) DESIGN STUDY OF AN EXPERIMENTAL LOOP WITH A MODEL OF A DOR COOLANT CHANNEL IN FULL SIZE. Andersen, Per; Andersen; Rolf; Pejtersen, Vagn S. (Scanprocess A/S, Copenhagen (Denmark); Grenness, Morten (Elsinore Shipbuilding and Engineering Co., Ltd. (Denmark)). Mar. 1965. 180p. Dep. mn.

A design study is presented on an experimental loop with a model of a deuterium-moderated organic-cooled fuel element and coolant channel of actual size. The purpose of the experiment was to test the mechanical performance of the fuel element channel and to use the loop as the outer part of a heat transfer experiment. The design study included description of the loop, description of the purification plant, preheating the loop, auxiliary systems for the experiment, flange sealing, materials, regulation, instrumentation, data for components, and price calculations. (B.G.D.)

36410 CONTROL ROD MECHANISM /EGCR/ (Engineering Materials). (Oak Ridge Operations Office (AEC), Tenn.). (CAPE-979).

44 drawings.

The mechanism includes the drive, drive motor, drive brake, manual drive, manual locking, scram clutch, scram control, shrouds, shock absorbers, cable and drum, position transmitters, and position indicators. Normal rod insertion and withdrawal speed is 2 in./min; scram velocity increases until it reaches 40 in./sec. Maximum deceleration of the rod will not exceed 4 g. (For details, see TID-4100.) (TCO)

36411 FIRE EXTINGUISHING SYSTEM FOR NUCLEAR REACTORS. (to Commissariat a l'Energie Atomique). French Patent 1,338,474. Aug. 19, 1963. Filed Aug. 7, 1962.

A magazine containing a store of divided noncombustible material is supported at a level above the upper ends of the reactor channels. The magazine communicates with any selected reactor channel by means of a network of flow passages. Retainers associated with each channel can permit the flow of divided material from the store into the channel, which is provided with means for preventing the escape of the material therefrom. (IIB)

36412 NUCLEAR REACTOR PERIOD METER. (to Commissariat a l'Energie Atomique). French Patent 1,352,155. June 1, 1964. Filed Nov. 7, 1962.

The period of a nuclear reactor is determined by recording on an endless, flexible magnetic tape serving as a magnetic memory. The tape is driven at a constant linear speed V around a closed path. In the direction of movement of the tape around the path are disposed: an eraser head; a recording head to which is applied an electric signal corresponding to the instantaneous amplitude of the neutron flux of the reactor; a first and a second reading head which are separated by a predetermined distance L corresponding to a movement time of the tape equal to (L/V). The levels corresponding to the neutron flux 1_1 and 1_2 at times t_1^V and t_2 are passed after amplification to a calculating device for evaluating the period of the reactor. (IIB)

36413 STABILITY IMPROVEMENT FOR NUCLEAR REACTOR AUTOMATIC CONTROL SYSTEM. (to United States Atomic Energy Commission). French Patent 1,395,221. Mar. 1, 1965. Priority date May 21, 1963, United States.

In a nuclear reactor servo control system an instantaneous physical measure of the difference between a desired function of power level and the same function of the actual measured power level is obtained and applied as an error signal to control element motive means. This causes the control elements to move at a velocity corresponding to the magnitude and sense of the error signal. The error signal is compensated before its application to the control element motive means by a factor related to the excess multiplication factor of the reactor whereby the stability of the control system is improved. (IIB)

36414 DRIVE MECHANISM FOR NUCLEAR REACTOR CONTROL RODS. (to Groupement Atomique Alsacienne Atlantique). French Patent 1,347,127. Nov. 18, 1963. Filed Nov. 12, 1962.

A control rod suspension member passes over a guiding device, one end of this suspension member being secured to the control rod and the other end being secured in a storage section. The mechanism comprises a first system for locking the suspension member in position and thereby securing the control rod against further movement. The first locking system is located between the control rod and the guiding device. A second locking system is provided for locking the suspension member between the guiding device and the storage section. The two locking

systems are mounted on a single frame. Means are provided for producing and controlling relative displacement of the guiding device and the frame, this displacement causing the progressive movement of the control rod when the first locking system is released, the return of the guiding device and the frame to the initial position when the second locking system is released, and the lowering of the control rod when the two locking systems are released. (IIB)

36415 CONTROL MECHANISM FOR A NUCLEAR REACTOR CONTROL ROD. (to Commissariat a l'Energie Atomique). French Patent 1,352,844. Jan. 13, 1964. Filed Oct. 30, 1962.

Bearing means support rotatably a hollow shaft against axial movement. A toothed rack is axially displaceable relative to the hollow shaft having a part within the shaft and is adapted for connection with the control rod. Transmission means are provided between the shaft and rack for axially displacing the rack in response to rotation of the shaft. (IIB)

36416 NUCLEAR REACTOR SHUT-DOWN DEVICE. (to Commissariat a l'Energie Atomique). French Patent 1,354,119. Jan. 27, 1964. Filed July 27, 1962.

In order to provide a rapid shutdown, a neutron absorbing material in divided form is introduced into the reactor core. The appropriate device comprises a vertical channel disposed in the reactor core and in which a pressure prevails which is equal to the pressure in the fuel channels. A reservoir is disposed above the vertical channel and adapted to receive a neutron-absorbing material in divided form. A valve is disposed between the reservoir and the vertical channel comprising a closure member articulated to the reservoir and biased by the difference between the pressure in the vertical channel and an adjustable pressure in the reservoir to a position in which it separates the reservoir and channel. The value of the last-mentioned pressure is such that, upon a predetermined drop of the pressure in the vertical channel, the valve opens and the material drops into the channel. A system is provided for returning the absorbing material to the reservoir after the material has dropped. (IIB)

36417 PRESSURE VESSEL FOR A NUCLEAR REACTOR. Komai, Kenichiro (to Hitachi Ltd.). Japanese Patent 1965-8320. Apr. 28, 1965. Filed May 9, 1962.

A pressure vessel is proposed in which brittleness caused by irradiation is effectively prevented without using other heat sources. The technique is applicable for reactor pressure vessels in which the in-pile temperature cannot produce an annealing effect. Partitions are installed in the pressure vessel circumferentially. A heat-holding material, i.e., stainless steel, is installed between the partitions and the vessel wall. (NSA of Japan)

Criticality Studies

Refer also to abstracts 35686, 35687, and 36524.

36418 (AAEC-E-146) BUCKLING AND INTEGRAL SPECTRUM MEASUREMENTS IN ^{235}U FUELLED SUB-CRITICAL ASSEMBLIES MODERATED BY BeO/FERTILE MATERIAL MIXTURES. McCulloch, D. B.; Duerden, P.; Brittliff, E. (Australian Atomic Energy Commission Research Establishment, Lucas Heights). Dec. 1965. 80p. Dep. mn.

Exponential experiments were carried out to give the materials buckling of a number of near-homogeneous ^{235}U/aluminum alloy fueled systems having fertile oxides intimately mixed with the BeO moderator. Relative fission rates of ^{235}U, ^{233}U, and ^{239}Pu were also measured in the equilibrium spectrum region of each assembly. Five assemblies having 5 wt % natural uranium oxide in BeO were investigated for a range of BeO/^{235}U atomic ratios from 1500:1 to 5700:1. A similar range covering four assemblies was examined for 5 wt % thorium oxide in BeO. A comparison of the experimental results with diffusion theory calculations is included. (auth)

36419 (AD-635160) CRITICAL MASS CALCULATIONS FOR COAXIAL-AND VORTEX-FLOW GASEOUS-CORE REACTORS. Plasma Research Laboratory Report No. 26, Tumm, Gunter W. (Columbia Univ., New York. Plasma Lab.). Apr. 1966. Contracts AF49(638)-1254; AF49 (638)-1634. 95p. CFSTI $3.00 cy, $0.75 mn.

Design point critical masses are calculated for two configurations of a gaseous core reactor. A new set of resonance and thermal cross sections, developed for this purpose, was used. The following effects and their influence on the critical mass are investigated: the relative position of the fuel region, the presence of hydrogen within the reactor cavity, the reactor operating temperature, the length-to-diameter ratio of the reactor, the presence of a nozzle, a simplified fuel density distribution, and the pressure vessel. For an optimum reactor geometry (corresponding to minimum critical mass) the critical mass of a vortex flow gaseous core reactor is five times smaller than the critical mass of the coaxial flow reactor. (auth)

36420 (AE-229) REACTION RATE DISTRIBUTIONS AND RATIOS IN FR0 ASSEMBLIES 1, 2, AND 3. Andersson, T. L. (Aktiebolaget Atomenergi, Stockholm (Sweden)). June 1966. 50p. Dep. mn.

The spatial distribution of different reaction rates and reaction ratios in Assemblies 1, 2, and 3 of the fast reactor FR0 was measured by fission chamber scans and foil activation technique. Assemblies 1 and 2 had cores of undiluted fuel (U-metal enriched to 20% ^{235}U) while the core of Assembly 3 was diluted with about 30 vol % graphite. All the systems had a thick Cu reflector. The experimental results were compared with calculated values obtained from DSN and TDC multigroup spectra and group cross-section sets for the reactions. Good agreement between experiment and calculations is generally obtained in the core region but in the reflector the neutron spectrum is calculated too hard. (auth)

36421 (AE-233) A SUMMARY REPORT ON ASSEMBLY 3 of FR0. Andersson, T. L.; Brunfelter, B.; Cecchi, P. F.; Hellstrand, E.; Kockum, J.; Londen, S-O.; Tiren, L. I. (Aktiebolaget Atomenergi, Stockholm (Sweden)). June 1966. 35p. Dep. mn.

The third core of the zero energy fast reactor FR0 consisted of 20% enriched uranium diluted to 29 vol % with graphite and had a volume of 50 liters. Like previous cores it was surrounded by a thick copper reflector. Measurements of critical mass, control rod reactivities, fine structure flux variations, and conversion ratios are summarized. In particular, effects associated with the heterogeneous arrangement of the uranium and graphite plates are examined. (auth)

36422 (AEEW-R-467) AN INVESTIGATION OF DIFFERENCES BETWEEN MEASURED AND CALCULATED BUCKLINGS OF A SERIES OF LIGHT WATER AND HEAVY WATER MODERATED EXPERIMENTAL CORES. Figgins, A. J. G. (Atomic Energy Establishment, Winfrith (England)). Feb. 1966. 38p. Dep. BIS $1.10. HMSO 5s.6d.

A series of light water and light and heavy water moderated exponential and critical experiments were analyzed using the METHUSELAH program and it was found that the calculated and measured critical bucklings differed significantly. The effect was most marked as the temperature of the moderator was raised in the light water cores where it amounted to 10 m^{-2} for a 200°C rise above room temperature. Of this discrepancy 3 m^{-2}, at the most, could be explained as being caused by the experimental cores not being large enough to have a central asymptotic region, leaving an unexplained difference of 7 m^{-2}. It is suggested that the only region in which METHUSELAH could be usefully modified to improve this agreement is in the calculation of the resonance escape probability. The calculated and measured results obtained at room temperatures are compared. (auth)

36423 (APED-4335) SIMPLE CALCULATION OF THE CELL DISADVANTAGE FACTOR IN CYLINDRICAL GEOMETRY. Pomraning, G. C. (General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.). Aug. 30, 1963. 10p.

A calculational method for thermal flux distribution in a fuel element and its associated moderator is presented. The method which has the two desired characteristics (isotropic flux return and a zero normal gradient) at the cell boundary is shown to have certain advantages over previous methods. (B.G.D.)

36424 (CEA-R-2883) ETUDE DES PARAMETRES $\bar{\rho}$, $\bar{\beta}$ ET Λ D'UNE PILE A EAU LEGERE. (Study of the $\bar{\rho}$, $\bar{\beta}$ and Λ Parameters of a Light-Water Reactor). Riche, Raymond (Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires). 1966. 95p. Dep. mn.

Thesis.

The kinetic and perturbation equations are derived from the time-dependent transport equation. Kinetic equations depend only on the ratios $a = \bar{\rho}/\bar{\beta}$ and $b = \bar{\beta}/\Lambda$, which are definite, while the reactivity $\bar{\rho}$, the delayed neutron fraction $\bar{\beta}$ and the generation time Λ are expressed in terms of an arbitrary function. The "static" definitions of these parameters, which reduce kinetic problems to a set of purely term dependent equations, introduce the effective fraction $\bar{\beta}$. One way of determining experimentally the ratio b is presented; it consists in analyzing the power transient after a rapid variation of the reactivity, caused by the implosion of an empty glass-ball. A simple interpretation is proposed. The apparatus can be transformed easily into a reactimeter. The value of the effective delayed neutron fraction $\bar{\beta}$ was determined by averaging the reactivity effects of a copper sheet through out the reactor core. (auth)

36425 (CONF-660606-10) PRINCIPLES OF AND PROBLEMS WITH PULSED NEUTRON REACTIVITY MEASUREMENTS. Becker, Martin (Knolls Atomic Power Lab., Schenectady, N. Y.). [1965]. Contract W-31-109-eng-52. 32p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From American Nuclear Society Meeting, Denver.

Several methods have been advanced by which pulsed-neutron techniques can be used to measure the reactivity of a subcritical assembly. The principal methods are described, and the factors which can inhibit the application of some of these procedures are discussed. (B.G.D.)

36426 (CONF-660606-11) DISADVANTAGE FACTORS IN CLOSE-PACKED LATTICES. Dudley, T. E. (Knolls Atomic Power Lab., Schenectady, N. Y.). June 1966. Contract W-31-109-eng-52. 29p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From American Nuclear Society Meeting, Denver.

The disadvantage factor is defined as the ratio of the volume averaged neutron flux in the moderator to that in the fuel. For thin moderators the disadvantage can approach a minimum and then actually increase as the fuel rods are packed even closer together. This effect is examined and analytical arguments for the existence of this behavior in close-packed lattice cells are given. The investigation includes both one- and two-dimensional geometries, and both diffusion theory and transport theory calculations. (M.O.W.)

36427 (CRRP-1235) THE PHYSICS OF LATREP. Gibson, I. H. (Atomic Energy of Canada Ltd., Chalk River (Ontario)). Mar. 1966. 131p. (AECL-2548). Dep. mn. AECL $3.00.

The computer code LATREP written in the Apex Language for the AECL G-20 machine calculates reactor lattice parameters. The basic physics of the code is described in detail as is the input data required; details of the coding are however not given. (auth)

36428 (GA-7072) THE INFLUENCE OF NEUTRON CROSS SECTIONS ON THERMAL REACTOR SPECTRA. Beyster, J. R.; Neill, J. M. (General Dynamics Corp., San Diego, Calif. General Atomic Div.). Apr. 4, 1966. Contract AT(04-3)-167. 36p. (CONF-660303-44). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From American Physical Society, Conference on Neutron Cross Section Technology, Washington, D. C.

For many applications thermal reactor spectra must be predicted with accuracy. The thermal spectra are determined by the scattering and absorption properties of the reactor medium. Absorption cross section data are generally obtained from standard compilations while reliable scattering cross section information is more difficult to obtain. Procedures for generating these data for spectral calculations and the degree to which spectra can now be predicted in thermal reactor systems are discussed. Examples of spectral problems involving the quality of absorption and scattering cross section data are given. Other factors influencing the ability to calculate thermal reactor spectra are also presented. (auth)

36429 (GA-7077) CALCULATION OF RESONANCE ABSORPTION IN DOUBLY HETEROGENEOUS MEDIA. Dyos, M. W. (General Dynamics Corp., San Diego, Calif. General Atomic Div.). Apr. 7, 1966. Contract AT(04-3)-167. 30p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A method is given whereby resonance absorption can be calculated in a lattice of fuel lumps when the fuel in the lumps is segregated into the form of coated grains. The method has been coded and included as an option in the GAROL code. (auth)

36430 (GA-7091(App. C)) TIME-OF-FLIGHT MEASUREMENT OF THE NEUTRON SPECTRUM FROM A SPHERICAL ^{235}U FAST REACTOR. Profio, A. E.; Antunez, H. M.; Crosbie, K. L.; Russell, J. L. Jr. (General Dynamics Corp., San Diego, Calif. General Atomic Div.). 4p.

The neutron spectrum from the Accelerator-Pulsed Fast Assembly, which is a seven-inch diameter sphere of 93%-enriched uranium similar to the Godiva reactor, was measured by the time-of-flight method. (B.G.D.)

36431 (KFK-384) INTERPOLATIONSFORMEL FUER SELBSTABSCHIRMUNGSFAKTOREN. (Interpolation Formula for Self-Shielding Factor). Kiefhaber, E.; Ott, K. (Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Neutronenphysik und Reaktortechnik). Dec. 1965. 10p. Dep. mn.

Some practical considerations on the neutron self-shielding factors of various materials in use at Karlsruhe are outlined and an interpolation formula for these factors is derived from the group constants calculations published by the Russians. The arguments leading to the choice of materials are presented and the various accuracy considerations are discussed. (G.O.Y.)

36432 (WCAP-2828) ANALOG ANALYSIS OF TRANSIENT NEUTRON FLUX BY DISCONTINUOUS SYNTHESIS. Godts, J. E. (Carnegie Inst. of Tech., Pittsburgh, Pa.). June 1965. 127p.

Thesis.

Pertinent literature available in the field of transient flux distribution and associated subjects is reviewed. The mathematical model is discussed and preliminary equations are derived. The mathematical process performed on the equations in order to make them adaptable to the simulation is described. The simulation circuitry is then described. Resulting conclusions from the simulation are discussed. (M.O.W.)

36433 SUB-CRITICAL EXPERIMENTS WITH BERYLLIA-MODERATED REACTORS. Gemmell, W.; Duerden, P. (Australian Atomic Energy Commission). At. Energy Austral., 9: No. 2, 18-23(Apr. 1966).

Beryllium oxide-moderated reactors were studied in an experimental program which sought to extend and confirm past experiments with BeO_2-^{235}U assemblies and then to proceed with studies on BeO_2-^{233}U and Pu configurations. The critical mass was determined by measuring neutron distribution within the subcritical reactor as a function of position. By this exponential method, the critical size can be determined when less than half the expected critical mass is available, provided multiplication of 1.5 to 2 is possible and the linear dimensions of the assembly are approximately half those of an actual reactor. (D.H.M.)

36434 THEORY OF NEUTRON SLOWING DOWN IN NUCLEAR REACTORS. Ferziger, Joel H. (Stanford

Univ., Calif.); Zweifel, P. F. Int. Ser. Monogr. Nucl. Energy, Div. X, 101: 1-310(1966).

Available from New York, Pergamon Press, 1966. $12.50.

Reactor theory is treated from the asymptotic viewpoint, and its limitations are delineated. Topics considered are slowing down effects on reactor criticality, slowing down in infinite and finite media, and numerical solutions of the Boltzmann equation. (J.F.P.)

36435 EFFECTIVE RESONANCE INTEGRAL OF URANIUM CARBIDE RODS. Boeuf, A.; Tassan, S. Nucl. Sci. Eng., 25: 365-72(1966).

The effective resonance integral of uranium carbide rods was measured, as a function of the surface-to-mass ratio, in the range $0.09 < S/M(cm^2/g) < 0.3$. The experimental technique used was based on the comparison of ^{238}U resonance neutron-capture induced activities of UC rods of varying diameter and of a U reference rod, irradiated in a slowing-down neutron flux. This technique avoided the need for the determination of a correction factor to the data, taking into account the slight departure of the neutron spectrum from the ideal 1/E dependence. The neutron slowing-down flux was monitored by activation of Au and Mo detectors. The results of the experiment are summarized by the following expression: $RI_{UC} = 3.14 + 26.95(S/M)^{\frac{1}{2}} \pm 4.5\%$b. Dresner's equivalence theorem was used to relate the above results to the effective resonance integrals measured for U and UO_2. The equivalence parameters resulting from the original treatment and from the modified treatment proposed by Levine were both applied. The close equivalence which was found for the measured resonance absorption by U, UO_2, and UC when using the latter parameter, gave an indirect support to the validity of Levine's calculation model. (auth)

36436 NEUTRON-PRODUCTION CROSS SECTION OF ^{238}Pu IN A FAST SPECTRUM. Stubbins, Warren Fenton; Barton, David M.; Lonadier, Frank D. Nucl. Sci. Eng., 25: 377-82(1966). (TID-22431).

The production cross sections $\overline{\sigma_p} = (\nu - 1 - \alpha)\sigma_f$, where $\alpha = \sigma_c/\sigma_f$ for ^{238}Pu and ^{239}Pu, were compared in the fast neutron flux at the center of a bare spherical critical assembly of ^{239}Pu. These quantities averaged by the fast-neutron spectrum indicate nearly the same properties for the even-even ^{238}Pu nucleus as for the odd-even ^{239}Pu nucleus. The ratio measured in a neutron flux peaked at 0.25 Mev with an average neutron energy $\overline{E} = 1.67$ Mev is $\overline{\sigma_p}(^{238}Pu)/\overline{\sigma_p}(^{239}Pu) = 1.01 \pm 0.06$, and $\overline{\sigma_p}(^{238}Pu) = 3.76 \pm 0.23$ b. The results of this study indicate that ^{238}Pu metal probably has a critical mass of the same order of magnitude as ^{239}Pu metal. (auth)

36437 METHODS FOR THE COMPARISON OF PULSED-NEUTRON SHUTDOWN MEASUREMENTS WITH THEORY. Wallace, S. K.; Teare, K. R.; Green, J. B. Nucl. Sci. Eng., 25: 407-12(1966).

The validity of the pulsed-neutron experiments frequently used for checking core-shutdown calculations is discussed. The analysis of the experimental methods is based on energy-dependent diffusion theory, since this, in its few-group form, is the usual core-design model. It is shown that the comparison of experimental and theoretical values of the fundamental-mode prompt decay constant is a valid check, but the Garelis and Russell method is subject to severe limitations. It is shown that certain assumptions must be made to deduce the Garelis and Russell equation and recommended that the extent to which these assumptions are violated be checked before attempting to use the Garelis and Russell method. (auth)

36438 LAGRANGE STABILITY IN REACTORS WITH A LINEAR FEEDBACK. Akcasu, A. Ziya; Noble, Larry D. Nucl. Sci. Eng., 25: 427-9(1966). (BNL-9459).

Two criteria for the Lagrange stability in reactors with an arbitrary linear feedback were derived. The feedback kernel is assumed to be $G(t) = r\delta(t) + K(t)$, where r is the power-reactivity coefficient, and K(t), which is assumed to be bounded and integrable in $(0,\infty)$ represents other feedback effects. The Laplace transform of K(t) is denoted by $\overline{K}(s)$. It is found that if $r < 0$ and $r + \overline{K}(s) = 0$ has no positive real roots, and if $\int_0^t K(x)dx \leq 0$ for all $t \geq 0$ in the case of $r = 0$, then all the solutions of the kinetic equations are bounded. (auth)

36439 NATURAL MODES OF THE XENON PROBLEM WITH FLOW FEEDBACK: AN EXAMPLE. Kaplan, S.; Yasinsky, J. B. Nucl. Sci. Eng., 25: 430-8(1966).

The physical question of the spatial stability of a reactor with respect to xenon oscillations corresponds to a mathematical question regarding the location in the complex plane of the roots of a certain eigenvalue problem. The introduction of feedback controllers to the imposition of constraints on the eigenvalue problem. The effect of certain such constraints on the locations of the eigenvalues is examined for the idealized case of a one-group uniforming reactor. It is found that the eigenvalues obey a rule related to Rayleigh's separation theorem for vibrating mechanical systems. A numerical example is given in which the solutions of the constrained eigenproblem are displayed, interpreted physically, and compared with those of the unconstrained problem. (auth)

36440 URANIUM (93.2 PERCENT) METAL CYLINDERS WITH THIN STAINLESS STEEL REFLECTORS. Mihalczo, J. T. (Oak Ridge National Lab., Tenn.). Nucl. Sci. Eng., 25: 444-5(1966). (ORNL-P-1918).

The prompt neutron decay constant at delayed critical was measured in uranium metal cylinders with top and bottom thick stainless steel reflectors. The data describing the reflected cylinders and an unreflected one of equal diameter are given, and neutron decay in the cylinders is shown. (J.F.P.)

36441 RESULTS OF HOMOGENEOUS CRITICAL EXPERIMENTS CARRIED OUT WITH ^{239}Pu, ^{235}U, AND ^{233}U. Bruna, J. G.; Brunet, J. P.; Caizergues, R.; Clouet d'Orval, C.; Verriere, P. (Commissariat a l'Energie Atomique, Paris). pp 235-48 of STI-PUB-114. (In French).

The properties of ^{239}Pu, ^{233}U, and ^{235}U were compared on the basis of critical experiments carried out on ALECTO assemblies with essentially the same geometry. On the basis of the results obtained, an attempt was made to determine empirically the slowing-down area as a function of concentration; the multiplication factor was calculated by using, for the cross sections, a secondary differential thermalization model developed for light water. Attempts were also made to determine prompt-neutron lifetimes using a pulsed-source method and to obtain information on absorption and fission cross sections in a hydrogenated medium. After carrying out various geometrical conversions which make it possible to go from critical dimensions in cylindrical geometry to critical dimensions in spherical geometry, the critical masses obtained in ALECTO were compared with other experimental results and with the French criticality guide curves. (D.C.W.)

Design and Feasibility

36442 EPITHERMAL MOLTEN-SALT REACTORS. Barthold, W. P. (Kernforschungsanlage, Juelich, Ger.). Kerntechnik, 8: 315-19(July 1966). (In German).

The properties of fused salts are outlined and the characteristics of the Aircraft Reactor Experiment and the Molten Salt Reactor Experiment are summarized. The advantages of epithermal molten salt reactors are given. The core, breeding blanket, cooling system, structural materials, breeding behavior, and the economy of an epithermal molten salt reactor are discussed. (J.S.R.)

36443 BOILING REACTOR. (to Allmaenna Svenska Elektriska Aktiebolaget). French Patent 1,368,086. June 15, 1964. Priority date Sept. 7, 1962, Sweden.

Above the core of a reactor a guide and support structure is arranged. This structure consists of a substantially closed vessel, through which runs a number of tubes for generating steam coming from the reactor core, and containing fuel elements, in the parts situated in the reactor core. The fuel elements are in direct contact with liquid coolant e.g., heavy water. The tubes have no connection

with the interior of the guide and support structure, but their outlet ports are situated above the guide and support structure in the steam chamber. The heavy water is used as moderator before it passes on to the openings of the tubes for generating steam. Through the reactor core and the guide and support structure also run tubes for superheating steam containing fuel elements in the part situated in the reactor core. These tubes are in communication with the interior of the steam-filled guide and support structure. (IIB)

36444 FAST REACTOR CORE. (to United States Atomic Energy Commission). French Patent 1,409,175. July 12, 1965. Priority date Oct. 16, 1963, United States.

A very large, light-metal-cooled fast nuclear reactor comprises a plurality of subcritical, slab-shaped fuel regions containing plutonium-239 loosely coupled by slab-shaped blanket zones containing depleted uranium disposed therebetween. The total volume of the fuel regions is over 800 liters. (IIB)

36445 ENERGY PRODUCTION PLANT. (to Commissariat a l'Energie Atomique). French Patent 1,375,799. Sept. 14, 1964. Filed Aug. 1, 1963.

The core and the heat exchanger of a nuclear plant are separated from one another by a radiation shield and are arranged in a reactor pressure vessel. The pressure vessel is adapted to withstand the pressure of the reactor cooling fluid. The core and the heat exchanger are placed in a secondary cell arranged within the vessel which cooperates with the reactor pressure vessel to form an annular zone. The annular zone comprises a double side wall bounding an annular space. Secondary cooling fluid flows in the annular zone between the pressure vessel and the secondary cell at a temperature below the temperature of the fluid leaving the heat exchanger. (IIB)

Fuels

Refer also to abstract 35693.

36446 (GAMD–6334) ELBOW: FUEL ELEMENT BOWING CODE. Katz, R. (General Dynamics Corp., San Diego, Calif. General Atomic Div.). Aug. 23, 1965. Contract AT(04-3)-167. 158p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

The ELBOW code was developed to treat the fuel element bowing phenomenon which results from unsymmetrical power generation, circumferentially nonuniform coolant temperature distribution, and an unsymmetrical fast neutron flux distribution. The bowing of a fuel element due to the above causes involves an interaction with the neighboring fuel elements. The bowing problem described here consists of determining the element deflections, restraint forces, and stress distribution. The solution of the problem was programmed for the IBM-7044 digital computer. Options are available in the program to analyze concentric-ring fuel elements, hexagonal reflector elements, dual-dial fuel elements cooled on the inner and outer surface, and the single-dial fuel elements cooled on the outer surface. Options are also available in the code to treat the effects of irradiation-induced creep, finite clearances between neighboring elements, and the case where the element is rotated 180° at a given time during the reactor lifetime. (auth)

36447 (KR–89, pp 153-73) BASIC CONSIDERATIONS IN THE DESIGN OF UO_2 FUEL ELEMENTS. Robertson, J. A. L. (Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.).

Complete design of UO_2 fuel elements from first principles is not yet possible. What can be done is to select a reference design from past experience, and analyze its behavior under the specific conditions of the reactor for which it is intended. Those phenomena that could limit the performance are well established and it is already possible to estimate approximately what their effect will be. However, the uncertainties in the estimates for a complete fuel assembly are sufficient to justify realistic test irradiations of prototypes. Conclusions obtained from one reactor can be completely inappropriate for the conditions of another. (auth)

36448 (KR–89, pp 174-80) DESIGN VIEWS ON METALLIC FUEL ELEMENTS FOR WATER COOLED POWER REACTORS. Mogard, Hilding (Aktiebolaget Atomenergi, Stockholm (Sweden)).

The most simple approach based on existing technology seems to be a restrained U metal fuel rod with a hollow core. To improve corrosion performance, non-bonded corrosion resistant alloys such as U_3Si might be used instead of U. Introduction of an intermediate ring zone of corrosion-resistant U alloy between core and cladding was also suggested. Other fuel design concepts might prove to be better in certain respects, but none of the proposed ones seems to meet the requirements of attractive neutron economy, low fabrication cost, and acceptable safety, except the U_3Si concept. The pressure vessel reactor appears suitable for safe use of U metal fuel because of open fuel arrangement and absence of vital component structures in the core. (J.R.D.)

36449 DISTRIBUTION OF THE FISSION PRODUCTS IN A FUEL PASTE. Guenther, K.; Matthies, S. (Zentralinstitut fuer Kernforschung, Rossendorf, Ger.). Kernenergie, 9: 159-65(May 1966). (In German).

In a fuel paste consisting of spherical fuel grains of about 10 μm in diameter packed rather closely in a liquid carrier medium (e.g. sodium), an essential part of the fission products flies into the carrier after recoiling. The average distribution of the fission products in the grains and the separated fraction as they exclusively result from recoil effect are theoretically calculated as functions of the range, the grain size, and the volume concentration of the grains. This essentially geometric problem was solved exactly for the internal and the external volume of an isolated grain. Moreover, a statistical theory was developed giving the distribution of the fission products with special regard to their injection into other grains for the limiting case of very low grain concentration. Starting from this point of view, an Interpolation technique is suggested for high grain concentrations requiring the calculation of the fission product distribution for two regular grain lattices. (auth)

Power and Power-Breeder Reactors

Refer also to abstract 36508.

36450 (AE–231) CALIBRATION OF THE FAILED-FUEL-ELEMENT DETECTION SYSTEMS IN THE AGESTA REACTOR. Strindehag, O. (Aktiebolaget Atomenergi, Stockholm (Sweden)). June 1966. 53p. Dep. mn. AB Atomenergi, Sweden 8:-.

Results from a calibration of the systems for detection of fuel element ruptures in the Agesta reactor are presented. The calibration was carried out by means of foils of zirconium-uranium alloy which were placed in a special fuel assembly. The release of fission products from these foils is due mainly to recoil and can be accurately calculated. Before the foils were used in the reactor their corrosion behavior in high temperature water was investigated. The results obtained with the precipitator systems for bulk detection and localization are in good agreement with the expected performance. The sensitivity of these systems was found to be high enough for detection and localization of small defects of pin-hole type ($v = 10^{-8} s^{-1}$). The general performance of the systems was satisfactory during the calibration tests, although a few adjustments are desirable. A bulk detecting system for monitoring of activities in the moderator, in which the γ-radiation from coolant samples is measured directly after an ion exchanger, showed lower sensitivity than expected from calculations. It seems that the sensitivity of the latter system has to be improved to admit the detection of small defects. In the ion exchanger system, and to some extent in the precipitator systems, the background from ^{41}Ar in the coolant limits the sensitivity. The calibration technique utilized seems to be of great advantage when investigating the performance of failed-fuel-element detection systems. (auth)

36451 (AECL-2568) IN-REACTOR CREEP MACHINES. Fidleris, V.; Isaac, H. N.; Koehler, H. P. (Atomic Energy of Canada Ltd., Chalk River (Ontario)). May 1966. 34p. (CONF-660521-2). Dep. mn. AECL $1.00.

From International Symposium on In-Pile Irradiation Equipment and Techniques, Harwell, Eng.

A review is presented of the background experience on which the logical development of the in-reactor creep machine design was based. The transitions from the NRX reactor type machine (fast flux approximately 1×10^{13} n/cm^2, gamma heating in machine = 0.3 watts/g) to NRU reactor machine (fast flux approximately 5×10^{13} n/cm^2, gamma heating in machine = 3 watts/g) and the transition from manually operated single units to a fully automated, computer logged multi-test system are described. Methods of maintaining steady temperature and stress conditions and obtaining reproducible strain measurements in the micro-inch range are described. Information is also presented on the results of handling the complex system in the caves for specimen changing and recalibration of vital parts such as pneumatic strain gages and stress applying bellows, as well as changing of faulty components such as heaters, thermocouples and bellows. (J.R.D.)

36452 (AEET-241) OLBUSTAP: A BURNUP PROGRAM FOR HEAVY WATER MODERATED UNIFORM LATTICES. Gopalan, R.; Subramanian, T. A. (Atomic Energy Establishment, Trombay (India)). 1965. 26p. Dep. mn.

The program OLBUSTAP (Open Lattice Burnup Studies of Th and Pu) developed for heavy water moderated, uniform lattices is described. It is in Fortran language for the computer CDC-3600. A system of burnup equations is solved numerically and the resulting isotopic compositions are used for calculating various lattice parameters by a conventional recipe. (auth)

36453 (AEET-242) PREOPERATIONAL ENVIRONMENTAL SURVEY FOR TARAPUR ATOMIC POWER PROJECT. Progress Report, 1964-65. Bhat, I. S.; Khan, A. A.; Kamath, P. R. (Atomic Energy Establishment, Trombay (India). Health Physics Div.). 1965. 71p. Dep. mn.

Routine monitoring sites were chosen and a study of radioactivity content in environmental samples was initiated. Forty-five sampling stations were located in the 32 km region round the site and 558 environmental samples were collected. Fallout levels, trace elements, and natural radioactivity content are determined in these samples. A description of this work is presented. (M.O.W.)

36454 (AI-CE-Memo-6(Vol.1)) HEAVY WATER ORGANIC COOLED REACTOR. 1000-Mwe NUCLEAR POWER PLANT PRELIMINARY CONCEPTUAL DESIGN. VOLUME I. ECONOMIC ANALYSIS. (Combustion Engineering, Inc., Windsor, Conn. Nuclear Div. Atomics International, Canoga Park, Calif.). Oct. 1, 1965. Contracts AT(38-1)-383; AT(38-1)-386. 64p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

A summary is presented of the plant description. An economic analysis was made with respect to fixed charges on invested capital, operating costs, and energy generation cost. (M.O.W.)

36455 (AI-CE-Memo-6(Vol.2)) HEAVY WATER ORGANIC COOLED REACTOR. 1000-Mwe NUCLEAR POWER PLANT PRELIMINARY CONCEPTUAL DESIGN. VOLUME II. PLANT DESCRIPTION. (Combustion Engineering, Inc., Windsor, Conn. Nuclear Div. Atomics International, Canoga Park, Calif.). Oct. 1, 1965. Contracts AT(38-1)-383; AT(38-1)-386. 294p. Dep. mn. CFSTI $6.00 cy, $1.50 mn.

The reactor is described in some detail. Coolant systems, moderator systems, reactor service systems, control and instrumentation, turbine plant, electrical systems, plant service systems, site and structures, and plant safeguards are described. (M.O.W.)

36456 (ANL-7143) REACTOR OSCILLATOR DETERMINATION OF CAPTURE-TO-FISSION RATIO IN AN UNDERMODERATED CRITICAL ASSEMBLY. Redman, W. C.; Bretscher, M. M. (Argonne National Lab., Ill.). Jan. 1966. Contract W-31-109-eng-38. 67p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

The feasibility of a proposed experimental method for the determination of the effective capture-to-fission ratio, $\bar{\alpha}$, for materials inserted in a low-flux reactor was demonstrated. The procedure involves a comparison of reactor response to oscillated samples of a fissile material, an absorber, and a spontaneous-fission neutron source, plus an experimental determination of fission rate for the fissile material and capture rate for the absorber. In addition, it is necessary that the neutron source be calibrated. These experimental results, combined with a knowledge of the number of neutrons per fission for the fissile material, yield a value of the quantity $1 + \bar{\alpha}$. Since $\bar{\alpha}$ for systems of particular interest in the current power reactor development program is appreciably less than unity, extreme accuracy is required for each of the experimental determinations on which the derived value of $1 + \bar{\alpha}$ is based, if even moderate accuracy is to be obtained in the resulting value for $\bar{\alpha}$. This method was tested in Hi-C Core No. 8, a critical assembly of 3% enriched UO_2 fuel pins, moderated and reflected by light water, in a lattice spacing which yields a hydrogen-to-^{238}U atom ratio of 2.91. The oscillator and absolute counting data yield a value of 0.217 for $\bar{\alpha}$, with a probable error of ±0.010 (4.6%). This result is in reasonable agreement with a calculated value of 0.233 and values of 0.215 and 0.220 derived from measured ^{235}U fission cadmium ratios and calculated thermal and epithermal values for $\bar{\alpha}$. (auth)

36457 (BAW-393-6) THORIUM FUEL CYCLE FOR HEAVY-WATER-MODERATED ORGANIC-COOLED REACTORS. Technical Progress Report No. 4, January-March 1966. (Babcock and Wilcox Co., Lynchburg, Va. Atomic Energy Div.). Contract AT(38-1)-393. 189p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

Work done on the Heavy Water Organic Cooled Reactor (HWOCR) Thorium Fuel Cycle Development Program during the period of January through March 1966 is described. The long-range objective of the Th fuel cycle development is the proof of performance of Th fuel elements in an HWOCR environment. The primary effort was related to the selection of a Th fuel element for future development. Three types of fuel elements were studied in detail: Th metal nested cylinders, ThO_2 clustered pins, and ThC clustered pins. On the basis of extensive parameter studies a near-optimum design of each type was selected for more detailed analysis and final evaluation. The economics and fuel utilization of the three fuel element types are evaluated for use in a 1000-Mw(e) HWOCR. Technical feasibility and development costs are also considered in the selection process. A test program was planned in conjunction with the optimization studies to define key technical problems and the development required. (auth)

36458 (BNL-10309) NUCLEAR POWER REACTOR TECHNOLOGY. Chen, John C. (Brookhaven National Lab., Upton, N. Y.). May 1966. Contract AT-30-2-GEN-16. 86p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

The current status and recent developments are reviewed for a number of the major types of power reactors. The reactor types discussed were selected on the basis of being either a well developed reactor type with substantial existing experience, or a prototype or concept which promises significant advances. In each case, a typical reactor is described to illustrate the characteristics of that particular class of reactors. Following that, recent significant developments and advances for that reactor class are reviewed to obtain some idea of the various versions that will likely evolve in the near future. (M.O.W.)

36459 (CEA-R-3004) REACTEURS G2/G3: PUISSANCE RESIDUELLE DES ELEMENTS COMBUSTIBLES. (Reactors G2/G3: Residual Power of the Fuel Elements). Fenart, Hubert (Commissariat a l'Energie Atomique, Chusclan (France). Centre de Production de Plutonium de Marcoule). Apr. 1966. 28p. Dep. mn.

After describing the experimental method used an account is given of tests carried out on active fuel elements, either in air, or in groups of four placed in a discharge container. A comparison with the theoretical results is

also made in the case of different irradiation and decay times. Information is obtained concerning: the residual power of the fuel elements, the can temperature which may be attained by these elements after extraction from the reactor, and the risk of ignition of the elements during normal discharging operations. (auth)

36460 (CEND-244) ADVANCED BONUS CORE DEVELOPMENT PROGRAM. Quarterly Progress Report No. 6, March–May 1965. Gibbons, J. F.; Knapp, R. W.; Mordarski, W. J.; Anderson, L. E.; Grubelich, F. T. (Combustion Engineering, Inc., Windsor, Conn. Nuclear Div.). May 1965. Contract AT(40-1)-3154. 198p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

A progress report is presented on the Advanced Bonus Core development program. The report includes mechanical design of the thermal cycle test element, design of the ABC Irradiation Test fuel element assembly, summary of ABC characteristics, fuel element analysis, EVESR test fuel element analysis, nuclear and economic properties of the current referenced ABC design, experimental program, and manufacturing development. (B.G.D.)

36461 (CEND-255) ADVANCED BONUS CORE DEVELOPMENT PROGRAM. Quarterly Progress Report No. 7, June–September 1965. Gibbons, J. F.; Anderson, L. E.; Grubelich, F. T. (Combustion Engineering, Inc., Windsor, Conn. Nuclear Div.). Nov. 8, 1965. Contract AT(40-1)-3154. 98p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

A discussion of the progress on the Advanced BONUS Core Development program is presented. Topics included are the completion of the manufacture of thermal cycle test elements, the completion of the shake-down operation of the thermal cycle test loop and the initial operation of the thermal cycle test, the manufacture of the fuel pellets was completed and the full order of 75 Kg of depleted UO_2 was shipped; the welding development on the fission gas containing welds of the solid multitube fuel element was completed and a final report issued, and a detailed description of the status and initial results of the thermal cycle test was given. (B.G.D.)

36462 (CONF-650413, pp 1-27) SOME APPLICATIONS OF MATHEMATICAL METHODS TO NUCLEAR ENGINEERING AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY. Gyftopoulos, Elias P. (Massachusetts Inst. of Tech., Cambridge).

A criterion of asymptotic stability for reactors described by nonlinear equations, including all delayed-neutron precursors, is briefly discussed. A procedure for deriving stability criteria by investigating the nature of equilibrium states at infinity is demonstrated, and an approach to problems of nonlinear optimum control for systems described by input-output functional relations is given. Some results on questions of space-time reactor dynamics are presented along with an application of dynamic programming to the problem of optimum refueling of a power reactor. (G.O.Y.)

36463 (CONF-650413, pp 544-65) COUPLED-CORE KINETIC BEHAVIOR. Pluta, P. R. (General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.).

The scope of a system model designed to predict the transient behavior of a coupled boiling–water centrally located superheat reactor power plant is discussed. Quantitative results describing the time-dependent power changes in two coupled cores resulting from ramp reactivity insertions into each core separately are given in terms of the degree of nuclear coupling between the cores. Several of the more interesting non-nuclear features of the plant simulations are introduced. (auth)

36464 (CONF-650413, pp 566-83) PRESSURE EFFECTS ON SPACE-DEPENDENT DYNAMICS IN BOILING SYSTEMS. Nahavandi, Amir N.; von Hollen, Richard F. (Westinghouse Electric Corp., Pittsburgh, Pa. Atomic Power Div.).

The effects of system pressure variation on the space-dependent dynamics of two-phase systems such as boiling-water reactors and conventional steam generators are investigated. The mathematical analysis is applied to the dynamic analysis of a typical direct-cycle forced-circulation boiling-water reactor with the pressure regulator operative. The results of this study indicate that the effect of system pressure variation combined with the nuclear-thermal-hydraulic interaction renders the system transient behavior more susceptible to oscillations. Improperly selected pressure-controller parameters could adversely affect the operation of an inherently stable system by introducing undesirable oscillations in the system-dependent variables. (G.O.Y.)

36465 (EUR-2962.f) CENTRALE NUCLEAIRE DES ARDENNES. RAPPORT ANNUEL 1965. (Ardennes Nuclear Power Plant. Annual Report, 1965). (Societe d'Energie Nucleaire Franco-Belge des Ardennes, Chooz-Lez-Givet (France)). Apr. 22, 1966. 70p. Dep. mn.

The design and construction work at the Ardennes nuclear power station performed during 1965 is summarized. A time schedule for the completion of the work and the start-up of the reactor is also included. A financial statement of the nuclear power plant is presented. (J.S.R.)

36466 (EUR-2995.e) THE THORIUM ORGEL TYPE REACTOR. Lafontaine, F.; Haytink, B.; Noailly, J. (European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center). 1966. 16p. Dep. mn.

The performances of an ORGEL reactor burning thorium fuels are given. In calculating them, the features of the ORGEL concept were maintained and no research and development on new materials were undertaken. The performances are compared with those of an ORGEL reactor burning natural or slightly enriched uranium. It seems that the ORGEL thorium type reactor presents some economic advantages only in the case of ^{233}U recycling and big power unit size (1000 Mw(e)). However, one must keep in mind that the uranium type reactor is ready to be made on industrial scale and it is not the case for the thorium type. (auth)

36467 (EUR-3000.e) THTR STATUS REPORT, 1965. (European Atomic Energy Community. Brown Boveri/Krupp Reaktorbau G.m.b.H., Duesseldorf (West Germany). Kernforschungsanlage, Juelich (West Germany)). 1966. 122p. Dep. mn.

The laboratory work and the engineering studies of a 300 Mwe prototype pebble-bed high temperature reactor are reviewed. Experimental work is reported on the mechanical behavior of the pebble bed, the problem of graphite corrosion and mass transfer, gas purification, heat exchangers, design of fuel elements and structural graphite, fabrication of fuel elements, irradiation of graphite as structural material for the reactor and fuel elements, irradiation of fuel in the form of coated particles and complete fuel element, fuel cycles, normal operational behavior of the reactor, and nuclear safety. The status of the development of the 300 Mw prototype is given and the principal characteristics of the installation are outlined. Special engineering problems encountered in the design and development of the prototype with respect to the steam generators and thermal stresses are discussed. The fuel element cycle is outlined. (J.S.R.)

36468 (GA-5366) TARGET: A PROGRAM FOR A 1000-Mw(e) HIGH-TEMPERATURE GAS-COOLED REACTOR. Quarterly Progress Report for the Period Ending May 31, 1964. (General Dynamics Corp., San Diego, Calif. General Atomic Div.). July 1, 1964. Contract AT(04-3)-167. 149p. Dep. mn. CFSTI $4.00 cy, $1.00 mn.

Preliminary design studies were made on various components of the 1000-Mw(e) reactor. The related research and development program on advanced fuels, turbocirculators, fuel cycles, alternate materials of construction, helium purification systems, and components is described. (M.O.W.)

36469 (GEAP-4813) CHEMISTRY OF ESADE-VBWR NUCLEAR SUPERHEAT LOOP. Skarpelos, J. M. (General Electric Co., San Jose, Calif. Vallecitos Atomic Lab.). Feb. 1964. Contract AT(04-3)-189. 38p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Radiochemistry measurements made during the ESH-1 irradiation gave no indication of defective fuel. Results

after "sipping" the fuel bundle at the completion of irradiation indicated that a fuel element might be defective; however, the signal was sufficiently weak indicating a small defect if one at all. Radiochemistry measurements made during the ESH-1.1 irradiation and results of "sipping" the fuel bundle after the irradiation did not indicate defective fuel. The chemistry of steam coolant during ESADE operation was significantly better than that provided during SADE operation; however, measurable chloride concentrations in reactor water were periodically observed during the ESADE irradiations. Sampling facilities provided with the loop did not supply adequate samples for all the chemistry information that was desired. The ESADE experience was used to design improved sampling facilities for the ESADA Vallecitos Experiment Superheat Reactor (EVESR). (auth)

36470 (GEAP-4870) SOME DESIGN AND IRRADIATION EXPERIENCE WITH CAPSULES FOR LONG, CERAMIC FUEL ELEMENTS. Knight, F. W.; O'Neill, G. L.; Rabin, S. A. (General Electric Co., San Jose, Calif. Advanced Products Operation). Nov. 1965. Contract AT (04-3)-189. 38p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Capsule B3A was designed primarily to study the potential for fission product plugging in a high-power fuel element of reference length in a Fast Ceramic Reactor (FCR) with its relatively high temperature and sharp temperature gradient at the upper fuel–blanket interface. The irradiation was terminated at about 20,000 Mwd/Mt peak burnup when an abnormally high temperature rise on the fuel cladding was recorded. A basic modification in capsule design was called for to prevent gas blanketing and burnout of the fuel in these high-burnup, fission-product-plugging tests having fuel of reference length. It was decided, therefore, to enlarge the liquid-metal-bond annuli to reduce the probability of gas blanketing and burnout. However, enlarging the annuli introduces coolant convection problems which were previously minimized with the thin-bond annuli. It was decided to capitalize upon, rather than resist, the convection tendency by designing a convection-circulating capsule. (auth)

36471 (GEAP-4934) SOUTHWEST EXPERIMENTAL FAST OXIDE REACTOR DEVELOPMENT PROGRAM. Fifth Quarterly Report, May–July 1965. Horst, K. M. (comp.) (General Electric Co., San Jose, Calif. Advanced Products Operation). Aug. 1965. Contract AT(04-3)-540. 122p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

A summary is presented on the research and development program for the Southwest Experimental Fast Oxide Reactor. The summary includes planning of the experimental program, experimental program in ZPR-III, fuel development, instrumentation, steady-state and transient characteristics of the core assembly, reactivity controls, fuel handling, and core design. (B.G.D.)

36472 (HIT-3616-4) PM-3A TYPE 2 CORE SAFEGUARDS ANALYSES. (Hittman Associates, Inc., Baltimore, Md.). Jan. 14, 1966. Contract AT(30-1)-3616. 58p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

The safety of operation of the PM-3A Type 2 Core was analyzed for various potential nuclear accidents and secondary system transients. Also the fission product inventory was very accurately determined at the end of life. In all analyses, the nuclear parameters were determined based on PM-3A design reports, the technical manuals for the PM-3A and the critical experiments on the as-built PM-3A Type 2 Core. The fission product inventory for the PM-3A Type 2 Core was calculated at the end of core life (24 Mw-Yrs) using the CINDER digital computer program. Potential cold startup accidents in the PM-3A plant were analyzed considering the beginning and end of life nuclear characteristics of the PM Type 2 Core. A reactivity insertion accident involving simultaneous withdrawal of all six control rods was analyzed for clean, beginning of life conditions. Initial reactor powers of 25 and 100% of full power were considered in the analysis. A cold water accident in the PM-3A plant in which it was postulated that cold water enters the shell side of a hot, dry steam generator at a rate of 80 gpm was analyzed. The credibility and consequences of a refueling accident were analyzed. Seven sequences of events were postulated and three were found to be credible. A guide rail system which would prevent the core from turning over and make the accident incredible is proposed. The guide rail system would require a minimum of modification of the refueling procedure, no modification of handling equipment and would be easily installed and removed. A loss of coolant flow accident was analyzed based on initial power level equal to nominal full power. A locked rotor was assumed and the end of life nuclear characteristics of the PM Type 2 Core were utilized in the analysis. Secondary system transients in the PM-3A plant with PM Type 2 Core were analyzed for both beginning and end of life conditions. A step loss of 75% of load from an initial 100% load was analyzed. A 100% loss of load accompanied by a scram was considered. Since the primary circulating pump is shut off after a scram, this accident is nearly identical and slightly less severe than the loss of flow accident. No damage to the core results. (M.O.W.)

36473 (IDO-17190) FINAL DISASSEMBLY AND EXAMINATION OF THE ML-1 REACTOR CORE. Murphy, T. L.; Schuyler, D. R.; Clarke, W. L. Jr. (Phillips Petroleum Co., Idaho Falls, Idaho. Atomic Energy Div.). June 1966. Contract AT(10-1)-205. 155p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

The final disassembly and metallurgical examination of the ML-1 reactor were performed in the Test Area North (TAN) Hot Cell complex at the National Reactor Testing Station. This examination was conducted to find and identify the failure mechanism and leak paths which led to the reactor shutdown. The reactor core was disassembled remotely, and a visual inspection made of the reflectors, control rod shields, control blades, pressure tubes, and lower tube sheet. Also investigation of several outer liners from fuel elements was made. Tests conducted on the core structure and various components revealed a degeneration of the stainless steel pressure tubes and the bottom surface of the stainless steel lower tube sheet. Failure in 20 percent of the welds joining the pressure tube to the tube sheet (trepan welds) was detected by dye-penetrant and pressure tests. Metallurgical examinations were made on specimens from the defective areas to determine the cause of failure. These failures ranged from corrosion pitting to stress-corrosion cracking. Fuel element outer liners were observed to be failing by corrosion near the bottom of the element. The corrosion was promoted by precipitation of second phase material in the grain boundaries of the liner material weld and nose guide. The precipitating second phase was believed to be sigma type rather than complex carbides. (auth)

36474 (INR-706/C) MERCURY-BOILING FUSED-SALT FAST REACTOR "WARS". Taube, M., Poturaj-Gutniak, S.; Kowalew, A.; Mielcarski, M. (Institute of Nuclear Research, Warsaw (Poland)). Apr. 1966. 7p. Dep.

The concept of a new type mercury-boiling fused salt fast reactor "WARS" is discussed. The fuel consists of: $^{239}PuCl_3$–fissionable material, $^{238}UCl_3$–fertile material and NaCl and/or KCl–diluent. Mercury metal was chosen as primary cooling agent. Mercury liquid is pumped into the fused salt giving dispersed system. Then it is heated to the boiling temperature. The boiling heat of mercury is a decisive element of heat balance in this type of reactor. Outlet mercury vapor is moderately superheated. (auth)

36475 (ITEF-416) ZADACHA O MAKSIMUME MOSHCHNOSTI REAKTORA. (The Problem of the Maximum Power of a Reactor). Kochurov, B. P.; Rudik, A. P. (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR. Institut Teoreticheskoi i Eksperimental'noi Fiziki). 1966. 12p. Dep. mn.

The maximum principle is used to find in one-group theory optimum fuel distribution along the reactor height resulting in the maximum reactor power under a thermal restriction on the fuel rod surface temperature. A reactor

is shown to be optimum if the fuel density in its periphery is maximum allowed while the equality in thermal restriction is held in the central zone. (auth)

36476 (KR–89) ADVANCED COURSE ON FUEL ELEMENTS FOR WATER COOLED POWER REACTORS INCLUDING SUPERHEAT ORGANIZED BY THE NETHERLANDS'-NORWEGIAN REACTOR SCHOOL AT INSTITUTT FOR ATOMENERGI, NORWAY, SEPTEMBER 13–SEPTEMBER 24, 1965. (Netherlands'-Norwegian Reactor School, Kjeller (Norway). Advanced Study Inst.). Sept. 1965. 316p. Dep. mn.

The course material is presented under fifteen topics. Separate abstracts were prepared for each topic. (J.R.D.)

For abstracts of individual papers see: 35836–35840, 35849, 35861, 35888, 35889, 36447, 36448, and 36477–36480.

36477 (KR–89, pp 197-237) CONSIDERATIONS IN DESIGNING SUPERHEAT FUEL ELEMENTS. Spalaris, C. N. (General Electric Co., San Jose, Calif. [Atomic Power Equipment Dept.]).

A review of conditions expected in operation of superheat reactors is presented. Information is also presented concerning fuel design calculations, fission gas release from UO_2 fuel elements, and EVESR Mark III clad stresses resulting from fission gases. Information is reviewed concerning aging changes in alloys, radiation effects on superheat alloys, superheat fuel shapes and fabrication parameters, and inspection techniques. (J.R.D.)

36478 (KR–89, pp 238-64) DESIGN OF SUPERHEATER FUEL FOR MARVIKEN. Margen, P. H. (Aktiebolaget Atomenergi, Stockholm (Sweden)).

An approach to design of optimum fuel elements for the Swedish Marviken is outlined. Discussions are included concerning the reactor, fuel element geometry and dimensions, fuel cans, oxide ratings, fuel cycle costs, fuel element heat transfer and reactor operating conditions. (J.R.D.)

36479 (KR–89, pp 265-89) SOME DESIGN AND DEVELOPMENT ASPECTS OF S.G.H.W. SUPERHEAT FUEL ELEMENTS. Pickman, D. O. (Reactor Group, United Kingdom Atomic Energy Authority, Springfields (England)).

Design concepts for steam generating heavy water reactor fuel elements are reviewed. Discussions are included concerning cost aspects, heat transfer, fuel materials, fuel cladding stresses and performance, and irradiation testing. (J.R.D.)

36480 (KR–89, pp 291-316) IN-CORE INSTRUMENTATION DEVELOPED FOR FUEL TESTING AT HBWR. Firing, J. A. (Institutt for Atomenergi, Halden (Norway)).

A review of development and use of in-core instrumentation at the HBWR is presented. Discussions are included concerning high specific power studies and fuel testing along with descriptions of designs for flow oscillators. Cladding thermocouples, differential transformers, burnout detectors, and void gages. (J.R.D.)

36481 (NP–16146(Vol.1)) TURKEY POINT NUCLEAR GENERATING UNITS NO. 3 AND NO. 4. PRELIMINARY SAFETY ANALYSIS REPORT. INTRODUCTION AND SUMMARY, DESCRIPTION OF SITE AND ENVIRONMENT. (Florida Power and Light Co.). [1964]. 188p. (DOCKET–50-250(Vol.1); DOCKET–50-251(Vol.1)). Dep. mn. CFSTI $5.00 cy, $1.00 mn.

A preliminary safety analysis report is presented on the Turkey Point nuclear generating plant in Florida. The report includes principal architectural and engineering criteria for design, plant description, design highlights, research and development requirements, identification of suppliers, consultants, engineers, and constructors, and site and environment analysis. (B.G.D.)

36482 (NP–16146(Vol.2)) TURKEY POINT NUCLEAR GENERATING UNITS NO. 3 AND NO. 4. PRELIMINARY SAFETY ANALYSIS REPORT. PLANT DESIGN DESCRIPTION AND SAFETY ANALYSIS. (Florida Power and Light Co.). [1965]. 234p. (DOCKET–50-250(Vol.2); DOCKET–50-251(Vol.2)). Dep. mn. CFSTI $6.00 cy, $1.25 mn.

A preliminary safety analysis report is presented on the Turkey Point nuclear generating plant in Florida. The report includes reactor design and operation, coolant system, containment system, and engineered safeguards. (B.G.D.)

36483 (NP–16146(Vol.3)) TURKEY POINT NUCLEAR GENERATING UNITS NO. 3 AND NO. 4. PRELIMINARY SAFETY ANALYSIS REPORT. PLANT DESIGN DESCRIPTION AND SAFETY ANALYSIS. (Florida Power and Light Co.). [1964]. 243p. (DOCKET–50-250(Vol.3)). Dep. mn. CFSTI $6.00 cy, $1.25 mn.

A preliminary safety analysis report is presented on the Turkey Point nuclear generating plant in Florida. The report includes electrical systems, plant instrumentation and control, reactor auxiliary systems, steam and power conversion system, radioactive wastes and protection, safety evaluation, and organization and training. (B.G.D.)

36484 (NP–16147(Vol.1)) MILLSTONE NUCLEAR POWER STATION DESIGN AND ANALYSIS REPORT. (Connecticut Light and Power Co., Hartford. Hartford Electric Light Co., Conn. Western Massachusetts Electric Co., Greenfield). [1965]. 409p. (DOCKET–50-245 (Vol.1)). Dep. mn. CFSTI $7.09 cy, $2.00 mn. AECW.

The Millstone Nuclear Power Station will be a single cycle, forced circulation, boiling water reactor capable of ultimate power levels of about 2010 Mw(t). A detailed design and analysis study was made for the following: site and environs, reactor design, reactor coolant system, containment systems, additional engineered safeguard features, radioactive waste control systems, station electrical systems, station control and instrumentation, reactor auxiliary services and cooling systems, steam and power conversion system, other station structures, conduct of operations, and safety and accident analysis. Accompanying engineering drawings are in Volume II along with further detailed studies such as reliability analysis of reactor protection system, control rod drive system description and analysis, jet pump development, core spray test program, and earthquake design criteria. (M.O.W.)

36485 (NP–16147(Vol.2)) MILLSTONE NUCLEAR POWER STATION DESIGN AND ANALYSIS REPORT. (Connecticut Light and Power Co., Hartford. Hartford Electric Light Co., Conn. Western Massachusetts Electric Co., Greenfield). [1965]. 296p. (DOCKET–50-245 (Vol.2)). Dep. mn. CFSTI $6.00 cy, $1.50 mn. AECW.

36486 (NP–16188) A METHOD OF ESTIMATING THE INTEGRATED THERMAL POWER PRODUCED IN A NUCLEAR POWER REACTOR (PHOTOVOLTAIC MONITOR). Report No. 2(Final). Kinderman, E. M.; Softky, Sheldon (Stanford Research Inst., Menlo Park, Calif.). Mar. 15, 1966. IAEA Contract 298/RB. 29p. Dep. mn.

For International Atomic Energy Agency, Vienna, Austria.

Stanford Research Institute has developed a photovoltaic cell in combination with its integrator, as a potential monitoring system for the integrated power generated by power reactors. The photovoltaic cell consists of a piece of anodized tantalum, with a gold counterelectrode evaporated on the anodic insulating film. When this device is irradiated with gamma radiation, it generates a current in the same manner as an illuminated solar cell. Such a radiation monitor appears simple to use since the photovoltaic cell can be small and easily inserted deep into the shield, outside the reflector of a reactor, where gamma radiation is proportional to reactor power. The integrating device can be left in a more accessible spot for readout with wires connecting it to the detector. Such a photovoltaic-cell, current-integrator system was developed and tested by Stanford Research Institute for the International Atomic Energy Agency (IAEA), Division of Safeguards. The detectors are reasonably linear in current output vs gamma-radiation intensity; a commercial electrolytic type of current integrator adequately integrates current from the detectors; a method for fabricating detectors with adequate long term (over six months) stability and reliability in gamma radiation fields was developed. (auth)

36487 (ORNL–3951) GAS-COOLED REACTOR PROGRAM SEMIANNUAL PROGRESS REPORT FOR THE

PERIOD ENDING MARCH 31, 1966. (Oak Ridge National Lab., Tenn.). July 1966. Contract W-7405-eng-26. 244p. Dep. mn. CFSTI $6.00 cy, $1.25 mn.

Separate abstracts were prepared for the 9 included sections. (M.O.W.)

For abstracts of individual sections see: 35862, 35893, 35894, and 36488–36492.

36488 (ORNL–3951, pp 135–48) STUDIES FOR AVR: GERMAN PEBBLE-BED REACTOR. Coobs, J. H.; McCurdy, H. C.; Sisman, O. (Oak Ridge National Lab., Tenn.).

Redeterminations were made of the fission-product content of the graphite powder that surrounded the AVR prototype spheres in capsule OIA-8 during irradiation because of large differences obtained in the initial analyses of 1-g portions. A correlation was made of the heat-generation rates with operating temperatures for AVR poolside irradiation capsules. A thermal analysis of AVR fuel elements in capsule OIA-8 was also made. (M.O.W.)

36489 (ORNL–3951, pp 169–91) FAST REACTOR DEVELOPMENT. McCurdy, H. C.; Sisman, O.; Perry, A. M. (Oak Ridge National Lab., Tenn.).

Irradiation tests were continued for the development of fuel for fast gas-cooled reactors. Details of test design conditions and procedures are determined in cooperation with GA. Irradiations of two capsules (designated P4A-1 and P4B-2) were completed. The capsules for which irradiation was completed were examined. These capsules each contained two UO_2-fueled Hastelloy-x-clad specimens. The results are described. (M.O.W.)

36490 (ORNL–3951, pp 192–3) HIGH-TEMPERATURE GAS-COOLED REACTOR NUCLEAR SAFETY PROGRAM. MacPherson, R. E. (Oak Ridge National Lab., Tenn.).

A program is under way to investigate high-temperature reaction rates in a steam-graphite system. Analytical models are to be developed, and both laboratory-scale and large engineering-scale experiments are planned. The assumptions and methods of the fission-product deposition model appear to be applicable to the steam-graphite reaction study. (auth)

36491 (ORNL–3951, pp 197–216) COMPONENT DEVELOPMENT AND TESTING. MacPherson, R. E.; Witt, F. J.; Walker, C. S. (Oak Ridge National Lab., Tenn.).

Brief summaries of research work on EGCR component development and testing are presented on the following: compressor shaft seals, charge machine cylinder-seal development, experimental investigation of auxiliary blower nozzle region of EGCR charge machine, flow tests of nozzles for the pneumatic temperature-measuring system, and metallurgical examination of nozzles for the pneumatic temperature-measuring system. (M.O.W.)

36492 (ORNL–3951, pp 217–24) IRRADIATION TESTING OF COMPONENTS AND MATERIALS. McCurdy, H. C.; Wechsler, M. S. (Oak Ridge National Lab., Tenn.).

Irradiation of capsule 04-8 is continuing. The fuel in this capsule which contains a 6-in. fuel pin made up of production specimens of EGCR fuel and cladding, has reached a burnup of 8410 Mwd/MT of UO_2. A new series of impact tests on irradiated base-plate and heat-affected-zone samples of pressure-vessel steel was initiated. The remotely controlled Charpy V-notch impact-testing machine was installed in the hot cell and its calibration was verified. Data on fracture energy versus temperature for unirradiated, irradiated, and postirradiation-annealed samples of ASTM A-212B carbon-silicon steel are presented. Additional recovery studies were conducted on irradiated tension test specimens of ASTM A-212B steel. Data are presented on the lower yield stress of specimens irradiated at 150, 235, and 292°C compared with unirradiated specimens. (M.O.W.)

36493 (TRG-Report-1207) ECONOMICS OF PLUTONIUM BREEDING, PLUTONIUM INVENTORY, AND URANIUM CONVERSION. Iliffe, C. E. (Reactor Group, United Kingdom Atomic Energy Authority, Risley (England)). 1966. 30p. Dep. BIS $0.90. HMSO 4s. 6d.

A formula is derived for the system generating cost of a nuclear power program which consumes only such plutonium as is produced within it. In order to apply the formula two alternative power programs, a small and large one, were assumed. As applied to plutonium-feed fast reactors, the formula is seen to account for plutonium through a quantity x, the discounted amount of electricity generated by such reactors expressed as a fraction of the corresponding amount for zero doubling time, and a unit credit k, the reduction in system generating cost per unit value of any plutonium surplus to the system. The fraction x and unit credit k are displayed graphically in terms of fast reactor inventory rating and doubling time for both power programs and for different rates of plutonium production from advanced thermal reactors, both with and without operation of some of the fast reactors on a ^{235}U feed. A similar formula is shown to apply to advanced thermal reactors. (auth)

36494 (TRG-Report-1210) DISPERSED CERAMIC FUELS AND THE ADVANCED GAS-COOLED REACTOR. D'Eye, R. W. M. (Reactor Group, United Kingdom Atomic Energy Authority, Springfields (England)). Jan. 5, 1966. 6p. Dep. BIS $0.30. HMSO 1s. 3d.

The trend in fuel element design to more onerous conditions of temperature, rating and burnup can lead ultimately to a limit for development of metal-clad fuels. One way of overcoming this limit in an AGCR system, CO_2 cooled, graphite moderated, without making any major conceptual changes to the design, is the adoption of an all-ceramic fission product retaining fuel. The results of a study to select and economically assess such a fuel, namely a uranium carbide coated with pyrolytic carbon, with these coated spheres dispersed in a matrix of silicon carbide, are briefly reviewed. The four stages in the fabrication route leading to the development and production of a suitable fuel pin are summarized. The physical and mechanical properties together with the irradiation trials of fuel pins are mentioned to indicate that the conditions required by the economic assessments are feasible. (auth)

36495 (WAPD-TM-604) PM-2A REACTOR VESSEL TEST: PHASE I. Monahan, J. M.; Halpine, P. A. (Bettis Atomic Power Lab., Pittsburgh, Pa.). July 1966. Contract AT(11-1)-Gen-14. 82p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

The PM-2A Reactor Vessel Test is designed as a program to obtain direct confirmation of pressure vessel brittle fracture prevention criteria by testing a full-size irradiated reactor vessel. Phase I, which has been completed, obtained nondestructive test data with the primary objective of the prediction of brittle fracture failure under the controlled conditions of the pressure–temperature testing to be conducted as Phase II. Dimensional, ultrasonic, and liquid penetrant examinations were made to provide data for a detailed stress analysis. Analytical and nondestructive measurements of the ^{54}Mn residual activity peaks were also utilized to obtain the integrated neutron flux seen by the vessel. (auth)

36496 (WCAP–6080) YANKEE CORE EVALUATION PROGRAM. Quarterly Progress Report for the Period Ending March 31, 1966. O'Boyle, M. J. (comp. and ed.) (Westinghouse Electric Corp., Pittsburgh, Pa. Atomic Power Div.). June 1966. Contract AT(30-1)-3017. 108p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Twelve cladding specimens from Phase I (14 Core I assemblies) and Phase II (one assembly cycled in Cores I and II) were burst-tested at elevated temperature (650°F). Although there was considerable scatter in the results, the expected trend to increased burst pressures with increased fast flux exposure was evident. Results from visual inspections and dimensional checks were evaluated for the intact Phase III fuel assembly and the eight individual Phase III fuel rods scheduled for further study. (Under Phase III, one of the original two Phase II assemblies was recycled again in Core IV.) These evaluations indicate that neither the extended in-core exposure (about three years) nor the high

burnup (estimated at 46,000 Mwd/Mtu peak) has had an adverse effect on the mechanical integrity of the Phase III assembly or its ability to operate as designed. The fuel assembly is in excellent condition: it operated entirely satisfactorily. Scheduled hot cell work on the eight Phase III fuel rods has progressed smoothly. The following operations were completed: (1) visual examinations; (2) dimensional measurements; (3) gamma scanning; (4) chemical defilming; (5) fission gas collection; (6) fuel rod sectioning; (7) sample preparation; and (8) autoradiography and radial drilling. Now in progress are metallographic examinations, mechanical tests, waste disposal, and chemical, radiochemical, and spectroscopic analyses of the spent fuel and, in certain instances, the cladding. Chemical and radiochemical corrosion-product data are being evaluated for the two Phase III fuel rods that were chemically defilmed. So far, these results appear consistent with those from Phases I and II. The only significant difference noted was the inability of the APAC treatment to remove the adherent oxide film from cladding surfaces that had been covered with loose deposits. This difference is being investigated further. Fission-gas results from six Phase III fuel rods were reviewed and judged valid for five of the six fuel rods punctured. Isotopic results from the first group of Phase III spent-fuel samples were evaluated and judged consistent with existing Yankee data. In turn, the second group of spent-fuel samples was released for mass spectrometric analysis. (auth)

36497 (EURFNR–68F) PROMPT SUPERCRITICAL POWER EXCURSIONS IN FAST REACTORS. Haefele, Wolf (Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Angewandte Reaktorphysik). Translation of report KFK–175. 31p. Dep. mn. JCL $3.60 fs, $1.13 mf.

Work Performed under United States–Euratom Fast Reactor Exchange Program.

A study is made of the critical behavior of a reactor with respect to externally applied ramp-type reactivity and the feedback effect of a prompt negative temperature coefficient, stress being placed on the peculiar features of fast reactors and the way in which they differ from thermal reactors. The case in which delayed neutrons are ignored is especially simple and permits almost exhaustive analytical treatment. A study is made of the circumstances under which the value for the prompt negative temperature coefficient can be read off from the curve of the (prompt) supercritical power excursion. This method of determining the prompt (Doppler) temperature coefficient is particularly interesting in the case of fast reactors and, above all, enables high temperatures to be used in the fuel, thus providing a valuable addition to measuring methods in critical zero-energy facilities. The technique discussed is to be employed in the planned American-German SEFOR reactor project (Southwest Experimental Fast Oxide Reactor), the purpose of which is to determine the Doppler coefficient. For the practical application of the derived formula, however, it is essential to perform studies on the influence of the delayed neutrons and possible simple ways of making allowances for this influence. It emerges that in the case where the reactor was operated at zero power before the power excursion ($\Phi \approx 10^7$ n/cm^2/sec), the influence of the delayed neutrons for excursions of more than 2 $/sec can during the first half of the first power excursion be allowed for merely by renorming the starting flux. (auth)

36498 REACTOR THERMOMETRY. PROBLEMS OF THE CONTACT TRANSMISSION INVESTIGATED AT EDF 1 AND EDF 2. Ventre, M. Bull. Inform. A.T.E.N. (Ass. Tech. Energ. Nucl.), No. 59, 33-6(May-June 1966). (In French).

The problem of data recovery with respect to temperature measurements in the EDF 1 and EDF 2 are considered. A description is given of a contact transmission line and the mechanical and electrical difficulties in the maintenance of this line. (J.S.R.)

36499 CRITICAL MASS OF SEFOR MOCKUP IN ZPR-III. Long, J. K. (Argonne National Lab., Idaho Falls, Idaho); McVean, R. L.; Reynolds, A. B.; Stewart, S. L.; Weitzberg, A.; Leridon, A. Nucl. Sci. Eng., 25: 442-4(1966).

The design of the SEFOR mockup in the ZPR facility is shown and described. The ZPR-3 assembly composition for the SEFOR mockup is also given. It was found that critical mass calculations using the current SEFOR 18-group cross section set and one-dimensional (cylindrical) diffusion theory techniques agree with experiment to within 1%. (J.F.P.)

36500 POLYMERIZATION OF CRYSTALLINE TRIOXANE. IV. THE SPONTANEOUS POLYMERIZATION. Van der Heijde, H. B. (Shell Research NV, Amsterdam). Phil. Mag., 13: 1055-67(May 1966).

The spontaneous transformation of trioxane crystals to crystalline, pseudomorphous polyoxymethylene is found to be a process of the type: $A_{cryst} \rightarrow B_{cryst}$, occurring in the surface regions of dry crystals only while these are in the act of a phase change, which may be either in integration or a disintegration. The morphology of the polymer is described and its bearing on the growth dynamics discussed. It is shown that the reaction, which can be affected reproducibly by zone-refining trioxane, cannot be understood in terms of initiation by chemical individuals and separate propagation of molecular chains. It must be a cooperative process involving many lattice planes synchronously, and is presumably closely connected with the electret character of crystalline trioxane. (auth)

36501 METHOD OF CONTROLLING A NUCLEAR REACTOR AND NUCLEAR REACTOR PLANT SUITABLE FOR CARRYING OUT THE METHOD. (to Sulzer Freres Societe Anonyme). French Patent 1,370,932. July 20, 1964. Priority date Sept. 10, 1962, Switzerland.

A nuclear reactor plant comprises a load control device which determines the power to be delivered by the plant and which acts directly upon a control unit determining reactor output. The means for circulating the heat carrier are controlled by a device which measures the neutron flux in the reactor, to control the speed of circulation of the heat carrier in dependence upon the measured neutron flux. The vapor generator of the plant is used as a heat accumulator to provide a more rapid change in the output of the whole plant. If an increase in output is intended, the reactor is adjusted immediately to the increased output. However, since the actual evolution of heat in the reactor occurs with considerable delay, a simultaneous increase in the speed of circulation of the heat carrier would mean that, initially, heat carrier at a relatively low temperature would enter the vapor generator and remove heat therefrom. Any such temperature drop is obviated as the rate of heat carrier circulation is increased only when the reactor output actually increased. (IIB)

36502 NUCLEAR REACTOR CONTROL. (to Sulzer Freres Societe Anonyme). French Patent 1,406,428. June 8, 1965. Priority date Sept. 13, 1963, Switzerland.

A nuclear power plant comprises a nuclear reactor and two load-medium circuits arranged to receive heat from a coolant which flows through the nuclear reactor and which which is heated as it flows therethrough. A feed flow control element is provided in each load-medium circuit. A temperature detector for detecting the temperature of coolant upstream of its entry to the reactor, is operatively connected to the feed flow control element in the two load-medium circuits, to control the flow rate therethrough in accordance with the temperature. A pressure detector in the live vapor line of each load-medium circuit is operatively connected to the feed flow control element in the particular circuit concerned. Interconnecting means are arranged so that an adjustment of one of the control elements in one sense by a pressure detector causes a simultaneous adjustment of the other flow control element in the opposite sense. (IIB)

36503 IMPROVEMENTS IN NUCLEAR REACTORS. (to Societe Belge pour l'Industrie Nucleaire). French Patent 1,349,565. Dec. 9, 1963. Priority date Feb. 13, 1962, Belgium.

During a normal power operation of a nuclear reactor

the variable poisoning effect due to xenon-135 is substantially compensated by modifying the concentration of a neutron absorbing substance in a portion of the primary fluid, to maintain the total reactivity effect of the xenon-135 and the neutron absorbing substance substantially equal to that due to the equilibrium concentration of xenon-135 at the reactor full power. (IIB)

36504 NUCLEAR REACTOR AND CONTROL OF ITS INSTANTANEOUS POWER OUTPUT. (to Sulzer Freres Societe Anonyme). French Patent 1,401,115. Apr. 20, 1965. Priority date Sept. 19, 1963, Switzerland.

The heat generated by the reactor is controlled in dependence upon a signal produced by measuring the neutron flux at a point in the reactor by a signal depending upon the heat output of the reactor. (IIB)

36505 CONTROL OF A NUCLEAR REACTOR PLANT. (to Sulzer Freres Societe Anonyme). French Patent 1,396,030. Mar. 8, 1965. Priority date May 17, 1963, Switzerland.

The reactor coolant circulating in a cooling circuit gives up its heat in a heat exchanger to a load medium circulating in a load circuit. The temperature of the coolant at its exit from the reactor is maintained substantially constant. The rate of flow of load medium through the heat exchanger is controlled in dependence upon the temperature of the coolant leaving the heat exchanger, and the rate flow of load medium through the heat exchanger is, upon a change in reactor output, additionally adjusted by a signal dependent upon the changed reactor output. (IIB)

Process Heat Reactors

36506 (BNL-959) THE IMPACT OF INTEGRATED MULTIPURPOSE NUCLEAR PLANTS ON THE CHEMICAL AND METALLURGICAL PROCESS INDUSTRIES. I. ELECTROCHEMONUCLEAR SYSTEMS. Steinberg, Meyer (Brookhaven National Lab., Upton, N. Y.). Dec. 1964. Contract AT(30-2)-Gen-16. 29p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The recent development of large-scale nuclear sources of low cost electrical power makes it possible to consider the coupling of nuclear power reactors with efficient electrochemical devices for large-scale production of industrial chemicals. The electrochemonuclear system consists of the three basic building blocks: nuclear reactor, d-c generator, and electrochemical cell. The electrochemonuclear generation of H_2 and O_2 is of interest for the fixation of N for fertilizers, generation of liquid and gaseous carbonaceous fuels, the production of Fe and steel, and the production of liquid H_2 and O_2 for aircraft and rocket fuel. Based on the speculation that low cost, high pressure water electrolyzers can be developed, estimates of the economics of electrochemonuclear ammonia production relative to conventional fossil-fuel-based plants are presented as a function of nuclear power costs. A desalinated water and fertilizer electrochemonuclear plant appears attractive. A dual-cycle, high temperature radiation and electrochemonuclear reactor offers a highly efficient N fixation system in the future. The realization of these concepts depends on a combination of low cost nuclear power, low investment electrochemical devices, and utilization of by-products. (J.R.D.)

36507 (AEC-tr-6744) ANALYSIS OF THE THERMAL EFFICIENCY OF POWER PLANTS WITH HIGH-CAPACITY STILLS. Sterman, L. S.; Gubenko, V. V. Translated from Paper No. SWD/70 Presented at the First International Symposium on Water Desalination, October 3-9, 1965, Washington, D. C. 17p. (CONF-651005-19). Dep. mn. CFSTI $1.00 cy, $0.50 mn. JCL $1.60 fs, $0.80 mf.

A method is described which makes possible the establishment of parameters for the optimum thermal efficiency of two-loop dual-purpose atomic stations. (B.G.D.)

Production Reactors

Refer also to abstract 36459.

36508 (ORNL-TM-1471) DETERMINATION OF THE POWER VS REACTIVITY FREQUENCY RESPONSE FUNCTION OF A POWER REACTOR, WITH APPLICATION TO THE HIGH FLUX ISOTOPE REACTOR. Lawrence, B. R. (Oak Ridge National Lab., Tenn.). July 5, 1966. Contract W-7405-eng-26. 38p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A description is given of a numerical technique for calculating the power vs reactivity frequency response function of a power reactor. The approach avoids the evaluation of transfer functions in an algebraic form. The space independent reactor kinetics model is used in conjunction with a general set of first order equations to represent the thermal performance of the reactor. Results obtained by applying the technique to the Oak Ridge High Flux Isotope Reactor indicate that the reactor operating at full power of 100 Mw with the flux controller off has a frequency response which peaks broadly at 10 cps with a $\delta P/P^0$ vs $\delta k/k^0$ gain of 140. (auth)

36509 GRAYLOC TOOLS (Engineering Materials). (General Electric Co., Richland, Wash. Hanford Atomic Products Operation). (CAPE-1358).

31 drawings.

The tools are used in Grayloc flange refacing, redressing, or burnishing. Separate tools are used for honing, machining, and burnishing to an 8 μ-in. finished surface as required in the 105-N reactor primary piping system. (For details, see TID-4100.) (TCO)

Propulsion and Space

See also ENGINEERING — Space Propulsion

36510 (CONF-650413, pp 164-81) SYNTHESIS OF OPTIMAL FEEDBACK CONTROL FOR NUCLEAR-ROCKET-ENGINE START-UP. Secker, Phillip A.; Weaver, Lynn E. (Arizona Univ., Tucson. Dept. of Nuclear Engineering).

Linear optimal feedback control theory is applied to the synthesis of an optimum nuclear-rocket-engine startup program by use of a model-following system. This theory generates a feedback program of linear gains that alter the plant dynamics such that the rocket-engine response approaches that of the model. If small perturbations are taken about the optimum trajectories, the system differential equations become linear with time-varying coefficients. The optimum feedback control minimizes an integral quadratic performance index containing system errors and control motions. Analog-computer studies show the effect of this synthesis technique in minimizing the system error due to the disturbances and the nonexact mathematical description of the system. (auth)

36511 (CEA-R-3022) MODELE MATHEMATIQUE DU COUT DE TRANSPORT MARITIME APPLICATION A LA COMPETITIVITE DU NAVIRE NUCLEAIRE. (A Mathematical Model for Cost of Maritime Transport. Application to Competitiveness of Nuclear Vessels). Dorval, Claude (Commissariat a l'Energie Atomique, Paris (France)). May 1966. 93p. Dep. mn.

In studying the competitiveness of a nuclear merchant vessel, economic assessments in terms of figures were discarded in favor of a simplified model, which gives a clearer idea of the mechanism of the comparison between alternative vessels and the particular influence of each parameter. An expression is formulated for the unit cost per ton carried over a given distance as a function of the variables (speed and deadweight tonnage) and is used to determine the optima for conventional and nuclear vessels. To represent the freight market involved in the optimization studies, and thus in the competitiveness computation, two cases are taken into account: the tonnage to be carried an-

nually is limited, and the tonnage to be carried annually is not limited. In both cases the optima are calculated and compared for a conventional and a nuclear vessel. Competitiveness curves are plotted as a function of the ratios of nuclear and conventional fuel costs and nuclear and conventional marginal power costs. These curves express the limiting values of the above two ratios for which the transport costs of the nuclear and conventional vessels are equal. The competitiveness curves vary considerably according to the hypothesis adopted for the freight market and the limit of tonnage carried annually. (M.O.W.)

36512 (CONF-650413, pp 182-205) CONTROL OF ABSORPTION CROSS SECTION FOR A NUCLEAR ROCKET. Shen, C. N.; Liu, T. C. (Rensselaer Polytechnic Inst., Troy, N. Y.).

The two-energy-group and one delayed-neutron-group kinetics equations with approximations are applied to the nuclear rocket. The response of the neutron flux and precursors having optimum control under different starting conditions is determined and plotted. (G.O.Y.)

36513 (CONF-650413, pp 437-56) REACTIVITY EFFECTS IN URANIUM–ZIRCONIUM HYDRIDE FUELED REACTOR POWER EXCURSIONS. Moss, Laurence I. (Atomics International, Canoga Park, Calif.).

Some theoretical considerations involved in establishing the prompt fuel-temperature coefficient during SNAP excursions are discussed, and the development of a simple approximation to describe reactivity-feedback effects during reactor expansion and disassembly is outlined. Calculations by these approximations are compared with experimental results. The suitability of the point kinetics approximation for these reactor systems is discussed, and the effects of the properties of the uranium-zirconium hydride fuel on the behavior of the reactor with respect to energy and fission-product release during destructive excursions are considered. (D.C.W.)

36514 (LA–3396) RADIATION MEASUREMENTS OF THE EFFLUENT FROM THE PHOEBUS 1A-321 REACTOR. Henderson, R. W.; Larson, O. W.; Fultyn, R. V. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). Feb. 1966. Contract W-7405-eng-36. 59p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Results are presented of documentation studies on the effluent from the full-power test of the Phoebus 1A-321 reactor. A description of procedures and equipment is given. An analysis of the environmental effects due to the passage and deposition of the released material is given, as well as deposition velocities measured at various locations. Results of the study of selected resin-coated trays by Los Alamos Scientific Laboratory Industrial Hygiene Group (H-5) are also presented. (auth)

36515 (LA–3447) DOSE RATE MEASUREMENTS ON THE KIWI B-4D-202 AND KIWI B-4E-301 REACTORS. Sanders, F. W. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). Jan. 1966. Contract W-7405-eng-36. 21p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Gamma dose rates were measured at several distances from Kiwi reactors B-4D-202 and B-4E-301 during testing. Measurements performed were similar to those made on previous Kiwi reactors. Peak gamma dose rates of 3.17×10^4 and 3.22×10^4 R/min were measured at 60 feet from B-4D and B-4E, respectively. The eight Kiwi reactors tested have yielded rather uniform gamma dose rates per megawatt of reactor power; the average value is 35.1 R/min-Mw, measured at 60 feet. (auth)

36516 (LA-DC–7781) REVIEW OF TRANSFER FUNCTION MEASUREMENTS IN THE NUCLEAR ROCKET PROGRAM USING NOISE TECHNIQUES. Wasserman, A. A.; Bodenschatz, C. A.; Steiner, G. H.; Honka, E. K.; James, L. R. (Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.); Balcomb, J. D.; Johnson, J. A.; Springer, T. E. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [1966]. Contract W-7405-eng-36. 18p. (CONF-660608–9). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 2nd AIAA Propulsion Joint Specialist Conference, Colorado Springs.

The body of experience in transfer function measurements using noise techniques which has been acquired by the Los Alamos Scientific Laboratory (LASL) and the Westinghouse Astronuclear Laboratory (WANL) during several series of nuclear rocket reactor tests at the Nuclear Rocket Development Station (NRDS) in Nevada is summarized. Such measurements, using random or pseudo-random input signals and cross-correlation data processing techniques, were performed by LASL during testing of the KIWI-A3, KIWI-B-4D, KIWI-B-4E, and Phoebus-1A reactor systems, and by WANL during testing of the NERVA Reactor Experiments NRX-A2, NRX-A3, and NRX/EST. The purposes of these measurements were to aid in control system design and checkout and to aid in validation of dynamic computer models used to predict overall system performance. (auth)

36517 (NAA-SR–6322) MERCURY RANKINE PROGRAM (SNAP 2). BOILER CONDITIONING: PHASE I RESULTS. Topical Report No. 30. Koestel, Alfred (Atomics International, Canoga Park, Calif.). June 23, 1966. Contract AT(11-1)-Gen-8. 82p. (TRW-ER–6660). Dep. mn. CFSTI $3.00 cy, $0.75 mn.

The Phase I Boiler Conditioning Tests were conducted to investigate the effects of independent variables on mercury boiler deconditioning or conditioning. No extensive data reduction was performed, and only sample calculations were obtained. Results of the testing indicated that the causes of deconditioning are the result of subtle interconnections among various variables. Control of these variables, as a method of preventing deconditioning, would involve an extensive development program. In the boiler design, deconditioning can be controlled by minimizing the effect of these variables. (auth)

36518 (NASA-CR–487) GASEOUS-FUELED CAVITY REACTORS: CRITICALITY CALCULATIONS AND ANALYSIS. (Allison Div., General Motors Corp., Indianapolis, Ind.). July 1966. 163p. CFSTI $5.00 cy, $1.00 mn.

Calculations were made to determine the effect of certain material, temperature, and dimensional variables on the criticality and size of a gaseous fueled cavity reactor for nuclear rocket propulsion. The specific reactor types considered were D_2O-, BeO-, and carbon-moderated. (M.O.W.)

36519 (NP–16166) SNAP-8 ELECTRICAL GENERATING SYSTEM DEVELOPMENT PROGRAM. Monthly Progress Report. (Aerojet-General Corp., Azusa, Calif.). May 1966. Contract NAS-5-417. 50p. (L–0740-05-17).

Further developments are reported on the power conversion system for SNAP-8. The specific components investigated are the turbine-alternator assembly, pump-motor assemblies, heat exchangers, valves and controls, startup system, and steady-state electrical controls. (M.O.W.)

36520 630A–MARK IV A NUCLEAR-FUELLED STEAM-GENERATOR/SUPERHEATER FOR MERCHANT SHIP PROPULSION. Delson, E. B.; Hunt, E. C. Marine Technol., 2: 390-422(Oct. 1965).

A review of the development work, an extensive description of the Mark IV version, a detailed analysis of its economic prospects in merchant-ship propulsion, and some general notes on the current administrative position (in the U.S.) regarding the construction and operation of nuclear merchant ships are given. (auth)

36521 NUCLEAR REACTOR PRIMER. Avallone, Eugene M.; Duke, Marvin L. (Naval Academy, Annapolis, Md.). Naval Eng. J., 78: No. 1, 65-74(Feb. 1966).

A general discussion is presented on maritime pressurized-water reactors. The basics of reactor operation are described. Several reactors are described. (M.O.W.)

Research and Test Reactors

36522 (AD–635085) THE NUMERICAL EVALUATION OF THE THEORETICAL VARIANCE/MEAN RATIO

OF THE NEUTRON POPULATION IN THE SUBCRITICAL CONDITION OF THE AFRRI-TRIGA REACTOR. Schow II, Horace (Armed Forces Radiobiology Research Inst., Bethesda, Md.). Jan. 1966. 23p. (AFRRI-TN-66-1). CFSTI $1.00 cy, $0.50 mn.

The numerical evaluation of the theoretical variance/mean ratio of the neutron population in the subcritical condition of the AFRRI-TRIGA reactor is given for the case of no delayed neutron groups, the case of one equivalent delayed neutron group, and the case of six delayed neutron groups. The Courant-Wallace equations were solved to obtain the theoretical variance/mean ratio using the mean prompt neutron lifetime of 39×10^{-6} seconds in the AFRRI-TRIGA reactor. (auth)

36523 (AD-635819) NEUTRON AND GAMMA DOSIMETRY MEASUREMENTS AT THE AFRRI-DASA TRIGA REACTOR. Sayeg, J. A. (comp.) (Edgerton, Germeshausen and Grier, Inc., [Boston, Mass.]). Nov. 1965. Contract DA-49-146-XZ-226. 169p. (AFRRI-CR-65-6). CFSTI $5.00 cy, $1.00 mn.

The experimental work initiated to determine the current and predicted dosimetry requirements of the Armed Forces Radiobiology Research Institute is summarized. The calibration and evaluation procedures used for determining neutron fluence, spectrum, and neutron and gamma tissue dose for radiobiological investigations are described. (M.O.W.)

36524 (AE-230) DIFFERENT ACTIVATION TECHNIQUES FOR THE STUDY OF EPITHERMAL SPECTRA, APPLIED TO HEAVY WATER LATTICES OF VARYING FUEL-TO-MODERATOR RATIO. Sokolowski, Evelyn K. (Aktiebolaget Atomenergi, Stockholm (Sweden)). June 1966. 35p. Dep. mn.

Spectral indices at the cell boundary were studied as functions of lattice pitch in the reference core of the Swedish RO reactor. Epithermal indices were determined by activation of ^{115}In, employing three different techniques: the two-foil, the cadmium ratio and the sandwich foil methods. The latter of these has the advantage of being independent of assumptions about foil cross sections or spectral functions, and it gives a spectrum index that lends itself readily to comparisons with theoretical multigroup calculations. Alternatively the results can be expressed in terms of the Westcott parameters r and T_n when this is justified by the spectral conditions. The agreement between the three methods investigated is generally good. Good agreement is also found with multigroup collision probability calculations of different degrees of complexity. (auth)

36525 (ANL-7219, pp 55-76) ADVANCED SYSTEMS RESEARCH AND DEVELOPMENT. (Argonne National Lab., Ill.).

Reactivity-control worths were measured in the fuel region for a full uniform loading of the AARR critical assembly. A steady-state heat transfer study was made in a simulated AARR core to measure the effect of channel spacing, flow, inlet water temperature, pressure, power upon pressure differential within the channel, void distribution, and critical heat flux. A thermal analysis was also made in the AARR beam tubes. (M.O.W.)

36526 (CONF-650413, pp 386-97) OPERATING CHARACTERISTICS OF THE WSMR FAST BURST REACTOR. Long, Robert L. (White Sands Missile Range, N. Mex.).

The White Sands Missile Range Fast Burst Reactor is an enriched uranium-molybdenum alloy assembly, unmoderated and unreflected, which provides a routine output of 5×10^{16} fissions per burst with a pulse width at half-maximum power of 46 μsec. A description of the reactor stand and core designs and the results from the first two months of operation are given. Effects on the core and reactor stand of the thermo-mechanical shocks generated during burst operations are described. (auth)

36527 (CONF-650413, pp 398-419) CHARACTERISTICS OF LARGE REACTIVITY INSERTIONS IN A HIGH-PERFORMANCE TRIGA URANIUM-ZIRCONIUM HYDRIDE CORE. Coffer, C. O.; Dee, J. B.; Shoptaugh, J. R. Jr.; West, G. B.; Whittemore, W. L. (General Dynamics Corp., San Diego, Calif. General Atomic Div.).

The operational capabilities of a TRIGA uranium-zirconium hydride core were investigated by subjecting the Advanced TRIGA Prototype Reactor to reactivity insertions up to $4.60 (3.22% $\delta K/K$). It was found that the reactor can be safely operated with reactivity insertions of this magnitude. (D.C.W.)

36528 (CONF-650413, pp 473-83) FEASIBILITY AND APPLICATION OF AN ACCELERATOR BOOSTER. Neill, J. M.; Beyster, J. R.; Russell, J. L. Jr. (General Dynamics Corp., San Diego, Calif. General Atomic Div.).

The concept of pulsing a fast reactor by mechanical means and simultaneously pulsing it by photoneutrons from a linear electron accelerator is discussed. The resulting burst of neutrons can be thermalized to give a pulsed source with an instantaneous flux greater than 10^{16} neutrons/cm^{-2} sec^{-1}. The application of this pulsed thermal source to time-of-flight studies is considered. A comparison of this pulsed source with other sources is made. (auth)

36529 (CONF-660624-1) A STUDY OF SPACE-DEPENDENT TRANSFER FUNCTIONS. Haugset, K. (Institutt for Atomenergi, Kjeller (Norway)). May 1966. 30p. (KR-107). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From EAES Symposium on Advances in Reactor Theory, Karlsruhe, Ger.

Measurement of the spatial dependent transfer function was performed in the zero-power reactor NORA, using the oscillator rod method. Frequency range was from 0.03 cps to 120 cps, and large spatial effects were detected at high frequencies. The experimental results are compared with a theoretical model of the space-dependent transfer function. This model is based on spatial eigenfunction expansion. Two-group diffusion theory gives good agreement with experiment in the whole frequency range. (auth)

36530 (IAEA-3498-14) PROGRESS REPORT OF NORA PROJECT, APRIL 1-JUNE 30, 1966. (Institutt for Atomenergi, Kjeller (Norway)). Contract AT(30-1)-3498. 17p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A report is presented on the NORA Project which includes reactor noise, pulsed neutron work, research on grey control elements, and cell parameters. (B.G.D.)

36531 ENERGY DISTRIBUTION OF γ RADIATION FROM THERMAL FISSION PRODUCTS AT THE CYCLIC OPERATION OF THE VVR-S REACTOR. Pavelescu, M.; Rosescu, T. (Inst. of Atomic Physics, Bucharest). Rev. Roum. Phys., 11: 345-7(1966).

The γ energy distribution in the VVR-S reactor for cyclic operation is calculated by using the new nuclear characteristics of fission products presented at the 1964 Geneva International Conference. (auth)

36532 RADIATIVE ENVIRONMENT IN THE THERMAL COLUMN VOID DURING IRT-2000 REACTOR SHUT DOWN. Krasin, A. K.; Naumov, V. A.; Kazazyan, N. A.; Kazazyan, V. T. Vestsi Akad. Navuk BSSR, Ser. Fiz. Tekh. Navuk, No. 4, 5-10(1965). (In Russian).

The gamma dose rate from ^{24}Na induced in ^{27}Al by the $^{27}Al(n,\alpha)^{24}Na$ reaction was calculated as giving a gamma reading of 11.8 R/hr in the thermal column of a 1000 kilowatt reactor two days after shutdown. Because of the short half life of ^{24}Na ($T_{\frac{1}{2}}$ = 16 hours) this activity has disappeared in ten half lives or about 10 days after reactor shutdown. Then the radiation dose in the thermal column is determined by the amount of ^{59}Fe ($T_{\frac{1}{2}}$ = 46 days) induced in the reinforced concrete. The dose rate from this source did not depend on the length of operation of the reactor and was found to be 85 mR/hr compared to an allowable 2.8 mR/hr. At this dose level a working time of ~30 min. was allowed at a distance of >50 cm. (TTT)

WASTE DISPOSAL AND PROCESSING

See also BIOLOGY AND MEDICINE — Ecology
CHEMISTRY — Radiochemistry
CHEMISTRY — Separation Processes and Procedures
HEALTH AND SAFETY

36533 (BMwF-FBK-66-04) UNTERSUCHUNGEN UEBER DAS VERHALTEN VON RADIONUKLIDEN IN KANALISATIONEN UND KLAERANLAGEN IM HINBLICK AUF EINE EINLEITUNG RADIOAKTIVER ABWAESSER MIT KURZZEITIG ERHOEHTEN KONZENTRATIONEN. (Behavior of Radionuclides in Sewer Systems and Purification Plants Subsequent to Discharge of Radioactive Wastes with Concentrations Increased Over Short Periods). Aurand, K.; Arndt, J.; Wolter, R. (Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Boden- und Lufthygiene). Apr. 1966. 40p. Dep. mn.

Hazards to sewer workers and populations caused by radioactive substances in sewage were evaluated. For sewer workers, there is practically no danger of incorporation. Hazards to sewer workers from external radiation exposure are only possible under extremely high activities, which practically do not occur. The population may ingest radioactive substances that enter the environment by way of sewage either through drinking water or foodstuffs. Limiting of concentrations in sewage ensures safe protection against hazardous ingestion through drinking water. For foodstuffs, limiting of activities to be released may be necessary because of possible concentrations particularly of long-lived radionuclides. The dilution of radionuclides temporarily entered into sewage was studied experimentally in low-capacity purification plants of different design. (auth)

36534 (BNWL–200) FIXATION OF HIGH-LEVEL RADIOACTIVE WASTES IN PHOSPHATE GLASS: HOT CELL GLASS EXPERIMENT. Upson, U. L. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). Jan. 1966. Contract AT(45-1)-1830. 73p. (CONF-660208–9). Dep. mn. CFSTI $3.00 cy, $0.75 mn.

From Symposium on Solidification and Long-Term Storage of Highly Radioactive Wastes, Richland, Wash.

Phosphate glass was produced from high-level fuel-reprocessing waste, demonstrating the technical feasibility of the continuous phosphate glass process. In this process, an aqueous waste is converted directly to a phosphate glass, with no intermediate drying or calcination step. Leachability of the product glass was as good as that of similar cold glasses, and has remained substantially constant for glass stored in dry air. Storage in moist air yielded 5- to 10-fold increase in leachability in the same period. An inherent instability of the glassy state, found especially at temperatures near the melting point, suggests that alternative polycrystalline forms also should be investigated. (J.R.D.)

36535 (RMO–3005(Suppl.)) SUPPLEMENT TO THE REPORT OF THE MONTICELLO MILL TAILING EROSION CONTROL PROJECT, MONTICELLO, UTAH. (Division of Raw Materials (AEC), Washington, D. C.). Apr. 20, 1966. 9p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Supplemental information is presented on the project to stabilize and cover the tailing ponds at the Government-owned millsite in order to prevent wind erosion and air transport of fine tailings, and to prevent tailings from being washed into an adjacent natural stream, thereby eliminating the possibility of radioactive contamination. Approximately 900,000 tons of low-level radioactive solid residues (tailings) impounded in four separate areas, totaling about 40 acres, were stabilized and covered. The tailings were stabilized, leveled, and graded to facilitate drainage, and were then covered with a rock and soil surface. Finally, after fertilizing, grasses were sown to prevent surface erosion. Inspections and surveys have revealed that surface soil erosion has been of a minor nature and there has been no evidence of radioactive material transport from the tailing areas. (J.R.D.)

36536 DISPOSAL OF RADIOACTIVE WASTE. Brit. Med. J., 1: 1435-6 (June 11, 1966).

Problems in radioactive waste disposal are discussed, particularly with respect to the various means of disposal and the possible dispersal of radioactivity into the environment and the attendant hazards. In 1964 the U. K. Atomic Energy Authority disposed of over 10,000 tons of solid wastes, consisting of contaminated building rubble, residues from process plants, and lab wastes by shallow burial at an approved site. Shallow burial has the disadvantage that the ground cannot be used for other purposes. There must be continual monitoring to ensure that unforeseen concentrations of radioactivity in water, soil, flora, and fauna do not arise. In the United Kingdom there has been no detectable increase in environmental contamination from leaching out of the buried waste. Shallow burial allows continuous dispersion of radioactive material at a rate designed to keep possible contamination below recommended limits. Incineration of radioactive waste and incorporation of the ash into materials such as bitumen which greatly reduce the extent of leaching makes acceptable burial of much more active solid waste than before. (TCO)

36537 NEW INDUSTRIAL INSTALLATION OF THE COMMISSARIAT A L'ENERGIE ATOMIQUE. PLANT FOR THE PROCESSING OF WASTES FROM THE CADARACHE CENTER OF NUCLEAR STUDIES. Marcaillou, Jacques (Commissariat a l'Energie Atomique, Paris); Roux, Jean; Brodsky, Michel. Bull. Inform. A.T.E.N. (Ass. Tech. Energ. Nucl.), No. 59, 17-26 (May-June 1966). (In French).

The characteristics of wastes from the Cadarache Center are outlined and the storage problems are outlined. The evaporation unit and the chemical treatment unit are described. Particular problems such as the calibration of liquids, control and operation, corrosion problems, and biological problems that arose during the study and construction of the installation are reviewed and solutions found are described. The installation cost and the first results obtained are considered. The economic balance tests with respect to the evaporation and the chemical treatment units are considered. (J.S.R.)

GENERAL AND MISCELLANEOUS

36538 (AECL–2407) ANNUAL REPORT, 1965–66. (Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.). 48p. Dep. mn. AECL.

Research and development on nuclear power, production of radioisotopes, and development of associated equipment are summarized. Sections are included on nuclear power programs, activities at Chalk River Laboratories, operation of Whiteshell Nuclear Research Establishment, production of commercial radioisotopes, international cooperation programs, and export of nuclear power stations. Financial statements and administrative information are included. (J.R.D.)

36539 (NP–16171) ANNUAL REPORT, 1965–66. (Department of Atomic Energy, Bombay (India)). 60p. Dep. mn.

A review of activities in the nuclear power development programs is presented. Research and development at Trombay was concerned with reactors, nuclear physics, equipment and instruments, electronics, health physics, chemical engineering, fuel processing, metallurgy, radiation chemistry and isotopes, biology, and radiation medicine. Activities at the Tata Institute of Fundamental Research include advanced mathematics studies, theoretical physics studies, investigations of nuclear structure and magnetism, high altitude investigations using balloons, air shower measurements, natural water analyses for tritium, and syntheses of biological macromolecules. The activities at other research institutions are also briefly reviewed. At Saha Institute the effects of radiation on DNA in cells was studied. At Tata Memorial Hospital ^{32}P was used to detect cancer of the nose and throat. Space research is discussed briefly. Activities in the Atomic Minerals Division included development of promising U deposits, and prospecting for U, Th, Be and other atomic minerals. Developments at the Tarapur and Rajusthan Atomic Power Projects are reviewed. (J.R.D.)

36540 SPECIAL ISSUE ON THE CASACCIA CENTER. Comit. Naz. Energ. Nucl., Notiz., 12: No. 5, 33–119(May 1966). (In Italian).

The history of the Casaccia Nuclear Studies Center, its functions, and purposes are reviewed. The research units, the principal facilities, and the services are described. Research programs are outlined. (M.C.G.)

36541 FUTURE OF WATER DESALINATION. Galstaun, Lionel S.; Currier, Edwin L. Power Eng., 70: 36-42(May 1966).

Use of nuclear and other forms of energy in desalination of seawater by various processes is examined. While fossil fuel costs vary widely from one location to another, nuclear fuel cycle costs are essentially unaffected by location. They are often somewhat lower than fossil fuel costs and will drop further as the scale of operations in the nuclear industry expands. However, nuclear steam-supply systems tend to cost more than fossil-fired units. Consequently, the most economical energy source can be selected only after thorough evaluation of the various options. Factors that apply to such an analysis include the size of the heat supply and the local cost of fuel delivered to the facility. Experience has shown that nuclear energy will tend to be economical in the larger plants and fossil fuel in smaller ones. Nuclear fuel cycle costs are heavily dependent on the size of the nuclear power industry. Future lower cost will result from increased volume of production and improved technology. It is shown that a nuclear fuel cycle cost of 14¢/million BTU is competitive with oil-gas fuel at 23¢/million BTU. A dual-purpose plant generating about 600 Mw (net) power and 150 million gal/day of desalted water was considered. (BBB)

CORPORATE AUTHOR INDEX

This index contains entries for this period for all report literature and, in addition, for certain published literature items for which it is felt that a corporate approach is especially desirable, e.g., symposia, conference proceedings, and meetings.

Each entry under a corporate author is a shortened version of the title of the publication, followed by the *NSA* volume and abstract number. Report numbers are given in parentheses.

The phrase "Progress report" is abbreviated as "Prog. rpt.," permitting a more rapid and complete alphabetical arrangement of the titles without changing the location of the progress report titles in relation to the other titles.

A

AEC COMPUTING AND APPLIED MATHEMATICS CENTER, NEW YORK UNIV., N. Y.
Engineering aspects of high-speed data distribution, 20: 35830 (NYO-1480-48)

AEROJET-GENERAL CORP., AZUSA, CALIF.
Prog. rpt. on SNAP-8 electrical generating system, 5/66, 20: 36519 (NP-16166)

AEROSPACE TECHNOLOGY DIV., LIBRARY OF CONGRESS, WASHINGTON, D. C.
Direct energy conversion in USSR: thermionic converters, 20: 36014 (AD-621726)

AIR FORCE MATERIALS LAB., WRIGHT-PATTERSON AFB, OHIO.
Chemical effects of irradiated triple-bond compounds, 20: 35535 (AD-634859)

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT ZEMNOGO MAGNETIZMA, IONOSFERY I RASPROSTRANENIYA RADIOVOLN.
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Transmission of solar corpuscular energy to magnetosphere and ionosphere, 20: 36099 (NBS-8815, pp 19.1-3)

AKTIEBOLAGET ATOMENERGI, STOCKHOLM (SWEDEN).
Activation techniques for epithermal spectra of heavy water lattices, 20: 36524 (AE-230)
Calibration of failed-fuel-element detection systems in Agesta reactor, 20: 36450 (AE-231)
Design of superheater fuel for Marviken, 20: 36478 (KR-89, pp 238-64)
Integral parameters of generalized frequency spectra of moderators, 20: 36404 (AE-228)
Integral transport theory in one-dimensional geometries, 20: 36136 (AE-227)
Metallic fuel elements for water-cooled power reactors, 20: 36448 (KR-89, pp 174-80)
Properties of metallic uranium, 20: 35837 (KR-89, pp 63-81)
Properties of sintered uranium dioxide, 20: 35836 (KR-89, pp 1-29)
Reaction rate distributions and ratios in FR0 assemblies 1, 2, and 3, 20: 36420 (AE-229)
Summary report on assembly 3 of FR0, 20: 36421 (AE-233)

ALABAMA UNIV., UNIVERSITY.
Single-level muon calculations for ^{12}C and ^{16}O, 20: 36154 (AD-635312)

ALASKA UNIV., COLLEGE. GEOPHYSICAL INST.
Telluric current studies of auroral zone micropulsation, 20: 36101 (NBS-8815, pp 27.1-19)

ALLISON DIV., GENERAL MOTORS CORP., INDIANAPOLIS, IND.
Gaseous-fueled cavity reactors: criticality calculations and analysis, 20: 36518 (NASA-CR-487)

AMERICAN SCIENCE AND ENGINEERING, INC., CAMBRIDGE, MASS.
Prog. rpt. on electrostatic analyzer to measure auroral electron energy and angular distributions, final, 6–10/65, 20: 35982 (AD-635162)

AMES LAB., IOWA STATE UNIV. OF SCIENCE AND TECH.
Condensed phase and vaporization equilibria in V(II) halide-I systems, 20: 35473 (IS-T-41)
Crystal structure studies of some unusual antimony bromide salts, 20: 35474 (IS-T-89)
Effects of electron correlation in x-ray diffraction and electron diffraction study of XeF_6, 20: 35475 (IS-T-93)
Influence of O on mechanical properties of Nb-5% Zr alloys, 20: 35887 (IS-T-92)
Sintering study in the partially vitreous As-S-Se system, 20: 35886 (IS-T-80)

ARGONNE NATIONAL LAB., ILL.
Advanced systems research and development, 20: 36525 (ANL-7219, pp 55-76)
Argonne cyclotron: ^3He conversion, 20: 35951 (ANL-7171)
Automatic scan system for reactor-fuel assay, 20: 35387 (ANL-7174)
Beta → alpha transformation in high-purity Pu, 20: 35883 (ANL-7135)
Development and fabrication of boron absorption tube for spectrographic analysis, 20: 35858 (ANL-7164)
General reactor technology, 20: 36392 (ANL-7219, pp 28-54)
Liquid-metal-cooled reactors, 20: 36391 (ANL-7219, pp 1-27)
Nuclear safety, 20: 36393 (ANL-7219, pp 77-89)
Operating parameters for compound solvent-extraction columns, 20: 35581 (ANL-7165)
Optical design of test strip periscope for H bubble chamber, 20: 35762 (TID-22937)
Prog. rpt. on reactor development, 5/66, 20: 36390 (ANL-7219)
Reactor oscillator determination of capture-to-fission ratio in an unmoderated critical assembly, 20: 36456 (ANL-7143)
Steady-state differential calorimeter used to measure gamma heating in reactor environment, 20: 35712 (ANL-7178)
Synthesis of optimal nuclear reactor control system, 20: 36405 (CONF-650413, pp 110-36)
TREAT experiments to provide data for fast reactor safety kinetics calculations, 20: 36400 (CONF-650413, pp 371-85)
Use of nuclear null-matrix in neutron-diffraction studies, 20: 36355 (ANL-7182)

ARIZONA UNIV., TUCSON.
Stability of nonlinear coupled-core reactors, 20: 36396 (CONF-650413, pp 77-87)

ARIZONA UNIV., TUCSON. CONTROL SYSTEMS LAB.
Closed-loop, approximately time-optimal control method, 20: 36397 (CONF-650413, pp 207-24)

ARIZONA UNIV., TUCSON. DEPT. OF NUCLEAR ENGINEERING.
Conference on neutron dynamics and control, University of Arizona, 4/65, 20: 36394 (CONF-650413)
Synthesis of optimal feedback control for nuclear-rocket-engine startup, 20: 36510 (CONF-650413, pp 164-81)

ARKTICHESKII I ANTARKTICHESKII NAUCHNO-ISSLEDOVATEL'SKII INSTITUT, LENINGRAD (USSR).
Long-period giant pulsations of geomagnetic field, 20: 36098 (NBS-8815, pp 18.1-6)

ARMED FORCES RADIOBIOLOGY RESEARCH INST., BETHESDA, MD.
Theoretical variance/mean ratio of neutron population in subcritical condition of AFRRI-TRIGA reactor, 20: 36522 (AD-635085)

ARMY ELECTRONICS LABS., FORT MONMOUTH, N. J.
Dirac monopole search, 20: 35948 (AD-635253)

ARMY NUCLEAR DEFENSE LAB., EDGEWOOD ARSENAL, MD.
Multiple detector system adapted for total absorption gamma-ray spectrometry, 20: 35727 (AD-635169)

ATOMIC ENERGY COMMISSION, WASHINGTON, D. C.
Conference on neutron dynamics and control, University of Arizona, 4/65,

20: 36394 (CONF-650413)

ATOMIC ENERGY ESTABLISHMENT, TROMBAY (INDIA).
OLBUSTAP: burnup program for heavy-water-moderated uniform lattices, 20: 36452 (AEET-241)
Prog. rpt. on theoretical reactor physics, annual, 1965, 20: 36388 (AEET-248)

ATOMIC ENERGY ESTABLISHMENT, TROMBAY (INDIA). HEALTH PHYSICS DIV.
Prog. rpt. on preoperational environmental survey for Tarapur Atomic Power Project, 1964–65, 20: 36453 (AEET-242)

ATOMIC ENERGY ESTABLISHMENT, WINFRITH (ENGLAND).
Burnout in climbing-film two-phase flow, 20: 35616 (AEEW-R-470)
Comparison between burnout data for 19-rod test sections cooled by Freon-12, 20: 35615 (AEEW-R-468)
Description of ELAN computer code, 20: 36137 (AEEW-M-621)
Differences between measured and calculated bucklings of light water and heavy water moderated cores, 20: 36422 (AEEW-R-467)
Speed of sound in mixtures of water and steam, 20: 35614 (AEEW-M-452)
SPLOSH II: program for nuclear-thermal-hydrodynamic behavior of water-cooled reactors, 20: 36389 (AEEW-R-441)

ATOMIC ENERGY OF CANADA LTD., CHALK RIVER (ONTARIO).
Canadian food irradiation facilities, 20: 35815 (AECL-2422)
In-reactor creep machines, 20: 36451 (AECL-2568)
Physics of LATREP, 20: 36427 (CRRP-1235)
Radiation induced electron emission, 20: 35993 (AECL-2567)
Tests on encapsulated lithium-drift germanium gamma-ray spectrometers, 20: 35730 (AECL-2569)

ATOMIC ENERGY OF CANADA LTD., CHALK RIVER (ONTARIO). CHALK RIVER NUCLEAR LABS.
Prog. rpt., annual, 1965–66, 20: 36538 (AECL-2407)
Zirconium alloys as sheathing materials, 20: 35849 (KR-89, pp 82-96)

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL (ENGLAND).
Angular distribution of neutrons scattered at small angles by ferromagnetic spin waves, 20: 36354 (AERE-R-4535)
ATLAS computer program to produce diffractometer control tapes, 20: 35735 (AERE-R-5213)
Bibliography on x-ray fluorescence analysis, 20: 35385 (AERE-Bib-136(Pt.1))
Compton scattering spectrometer, 20: 35733 (AERE-R-5073)
Determination of zirconium in ceramic magnesia by neutron activation analysis, 20: 35386 (AERE-R-5108)
Development and application of Li-drift germanium diodes at A.E.R.E., 20: 35734 (AERE-R-5206)
Galvanic cell for measuring U activity in carbides at high temperature, 20: 35470 (AERE-R-4983)
Gamma dose-rate alarm system, 20: 35731 (AERE-M-1155)
Quantizing half-tone generator for facsimile recording, 20: 35711 (AERE-R-4878)
Reports on two-phase heat transfer issued by A.E.R.E., Harwell, 20: 35617 (AERE-Bib-150)
Segregation of UO_2 and ThO_2 powders mixed to fine-scale homogeneity, 20: 35833 (AERE-M-1706)

ATOMIC POWER DEVELOPMENT ASSOCIATES, INC., DETROIT, MICH.
Determination of hydrogen in sodium metal, 20: 35388 (APDA-183)

ATOMIC WEAPONS RESEARCH ESTABLISHMENT, ALDERMASTON (ENGLAND).
SWANTIME: time-dependent multi-group diffusion code for IBM-7030, 20: 36138 (AWRE-O-3/66)
Thermal stability of samarium and gadolinium hydrides. II., 20: 35471 (AWRE-O-31/66)

ATOMICS INTERNATIONAL, CANOGA PARK, CALIF.
Double-diaphragm reactor safety device, 20: 36407 (NAA-SR-Memo-8925)
HWOCR, 1000-Mwe nuclear power plant preliminary conceptual design: economic analysis, 20: 36454 (AI-CR-Memo-6(Vol.1))
HWOCR, 1000-Mwe nuclear power plant preliminary conceptual design: plant description, 20: 36455 (AI-CE-Memo-6(Vol.2))
Mercury Ranking Program (SNAP 2) boiler conditioning. Phase I., 20: 36517 (NAA-SR-6322)
Prog. rpt. on unclassified programs, 1–3/66, 20: 35841 (NAA-SR-11900)
Reactivity effects in U–Zr hydride-fueled reactor power excursions, 20: 36513 (CONF-650413, pp 437-56)

AUSTRALIAN ATOMIC ENERGY COMMISSION RESEARCH ESTABLISHMENT, LUCAS HEIGHTS.
Buckling and integral spectrum measurements in ^{235}U fueled sub-critical assemblies, 20: 36418 (AAEC-E-146)
Development of ceramic coatings for fission-product retention in ceramic fuels, 20: 35856 (AAEC-E-148)
Impurities and their effects in nuclear-grade beryllia powders, 20: 35857 (AAEC-TM-311)
Response matrices in double P_N approximation of neutron transport theory, 20: 36134 (AAEC-E-149)
SCATLD: tape editing program for GYMEA neutron scattering libraries, 20: 36135 (AAEC-TM-310)
SHUTDOWN: reactor shutdown optimization code, 20: 36403 (AAEC-TM-314)
Thermoelastic stress in epitrochoidal cylindrical nuclear fuel elements, 20: 35882 (AAEC-TM-312)

AVCO CORP., TULSA, OKLA.
Blistering of metal surfaces by solar-system ions, 20: 35933 (N-66-18156)

AVCO-EVERETT RESEARCH LAB., EVERETT, MASS.
Optimization of thermal efficiency of magnetic annular arc, 20: 35635 (NP-16213)

B

BABCOCK AND WILCOX CO., LYNCHBURG, VA.
Multipurpose, single-cycle solvent extraction plant for nuclear fuel reprocessing, 20: 35582 (BAW-279)

BABCOCK AND WILCOX CO., LYNCHBURG, VA. ATOMIC ENERGY DIV.
Prog. rpt. on thorium fuel cycle for heavy-water-moderated organic-cooled reactors, 1–3/66, 20: 36457 (BAW-393-6)

BATTELLE MEMORIAL INST., COLUMBUS, OHIO.
Casting and powder-metallurgy forming of precipitation-hardenable stainless steels, 20: 35865 (RSIC-491)
Prog. rpt. on civilian applications, 3/66, 20: 35834 (BMI-1767)

BATTELLE-NORTHWEST, RICHLAND, WASH. PACIFIC NORTHWEST LAB.
High-level radioactive wastes in phosphate glass, 20: 36534 (BNWL-200)
Improved cartridge-type linear variable differential transformer, 20: 35713 (BNWL-15)
Neutron dosimetry using fission fragment damage principle, 20: 35740 (BNWL-SA-516)

BECHTEL CORP., SAN FRANCISCO, CALIF.
Unique features of Texas A and M variable-energy cyclotron, 20: 35962 (ORO-3398-5)

BETTIS ATOMIC POWER LAB., PITTSBURGH, PA.
CRIB 1: steam generator stability analysis program for Philco 2000, 20: 35625 (WAPD-TM-530)
PM-2A reactor vessel test: Phase I., 20: 36495 (WAPD-TM-604)
TOPS: a FORTRAN program for transient thermodynamics of pressurizers, 20: 35626 (WAPD-TM-545)
Variational principle for neutron diffusion equation using discontinuous trial functions, 20: 36143 (WAPD-T-1885)

BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Annihilation ($p\bar{p}$) in flight to meson and electron pairs, 20: 36023 (CALT-68-70)
Fluidized-bed reprocessing of stainless steel clad UO_2 power reactor fuels, 20: 35583 (BNL-968)
Impact of integrated multipurpose nuclear plants on chemical and metallurgical process industries. I., 20: 36506 (BNL-959)
Measurement of doses of ^{60}Co gamma rays with ultraviolet-transmitting lucite, 20: 35738 (BNL-985)
Nuclear power reactor technology, 20: 36458 (BNL-10309)
Reprocessing of nuclear fuels by volatility separations in fluidized beds, 20: 35584 (BNL-973)
Short and long wavelength disturbances of two-component collisionless plasma, 20: 36276 (BNL-10330)
Simulation techniques applied to design of 80-inch liquid H bubble chamber expansion system, 20: 35739 (BNL-10326)
Status of gamma irradiator design, 20: 35606 (BNL-10257)
Superconducting AG synchrotron magnets, 20: 35952 (BNL-10297)
Two-body kinematics tables, 20: 36022 (BNL-945)

BROWN BOVERI/KRUPP REAKTORBAU G.M.B.H., DUESSELDORF (WEST GERMANY).
Prog. rpt. on Thorium High Temperature Reactor, 1965, 20: 36467 (EUR-3000.e)

BROWN UNIV., PROVIDENCE, R. I. DEPT. OF PHYSICS.
Prog. rpt. on high energy physics, annual, 9/65–8/66, 20: 36040 (NYO-2262TB-125)

BUNDESGESUNDHEITSAMT, BERLIN (WEST GERMANY). INSTITUT FUER WASSER-, BODEN- UND LUFTHYGIENE.
Behavior of radionuclides in sewer systems and purification plants subsequent to discharge of radioactive wastes, 20: 36533 (BMWF-FBK-66-04)

BUREAU OF MINES, WASHINGTON, D. C.
Nuclear blasting and its potential for stripping overburden, 20: 35603 (CONF-660114-1)

C

CALIFORNIA INST. OF TECH., PASADENA.
Annihilation ($p\bar{p}$) in flight to meson and electron pairs, 20: 36023

(CALT-68-70)

CALIFORNIA INST. OF TECH., PASADENA. W. M. KECK LAB. OF ENGINEERING MATERIALS.
Superconducting transitions in body-centered cubic Tl–In alloys, 20: 35884 (CALT-221-19)

CALIFORNIA UNIV., BERKELEY.
Cesium ion sputtering of monocrystalline aluminum, 20: 36000 (TID-23132)

CALIFORNIA UNIV., BERKELEY. COLL. OF ENGINEERING.
Friction in ultrahigh vacuum. Preliminary tests on Al surfaces, 20: 35897 (UCRL-13212)

CALIFORNIA UNIV., DAVIS. CROCKER NUCLEAR LAB.
Central region studies for incorporating an axial ion source in Davis 76-in. cyclotron, 20: 35969 (UCD-CNL-49)

CALIFORNIA UNIV., LA JOLLA, SAN DIEGO.
Origin of the moon, 20: 35986 (UCSD-34P43-5)

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF PHYSICS.
Prog. rpt. on particle physics, annual, 6/65–5/66, 20: 36043 (TID-23206)
Selected final states in K⁻p scattering at 2 Bev/c, 20: 36042 (TID-23191)

CAMBRIDGE ELECTRON ACCELERATOR, MASS.
Accelerator development program, 20: 35954 (CEAL-TM-147)

CARNEGIE INST. OF TECH., PITTSBURGH, PA.
Analog analysis of transient neutron flux by discontinuous synthesis, 20: 36432 (WCAP-2828)

CASE INST. OF TECH., CLEVELAND, OHIO.
Electromagnetic scattering of charged particles with spin, 20: 36156 (COO-1573-1)
Measurement of energetic test electron interactions with plasma, 20: 36283 (N-66-17353)

CENTRALNE LABORATORIUM OCHRONY RADIOLOGICZNEJ, WARSAW (POLAND).
Absolute method of gamma-ray background determination by means of NaI(Tl) scintillation counter, 20: 35743 (CLOR-46/D)

CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE, BRUSSELS (BELGIUM).
Plutonium purification with ion exchange resins, 20: 35585 (EURAEC-1639)

CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE, MOL (BELGIUM).
Prog. rpt. on reprocessing of irradiated fuels, 10–12/65, 20: 35586 (EURAEC-1646)

CHEMICAL AND RADIOLOGICAL LABS., ARMY CHEMICAL CENTER, MD.
Design of UO_2 fuel elements, 20: 36447 (KR-89, pp 153-73)

CHICAGO UNIV., ILL.
Triplets, static SU(6), and spontaneously broken chiral SU(3) symmetry, 20: 36061 (COO-264-308)

CHICAGO UNIV., ILL. DEPT. OF GEOPHYSICAL SCIENCES.
Theory of Dst main phase and associated phenomena, 20: 36100 (NBS-8815, pp 20.1-3)

CHICAGO UNIV., ILL. INST. FOR COMPUTER RESEARCH.
Prog. rpt. on computer research, 5/66, 20: 35829 (COO-614-45)

CHICAGO UNIV., ILL. METALLURGICAL LAB.
Chemistry, purification and metallurgy of plutonium, 20: 35383 (MUC-JCW-223(Books 1 and 2))

COLUMBIA UNIV., NEW YORK.
Prog. rpt. on particle physics, 6/66, 20: 36157 (CU-1019-51)

COLUMBIA UNIV., NEW YORK. PLASMA LAB.
Critical mass calculations for coaxial and vortex-flow gaseous-core reactors, 20: 36419 (AD-635160)

COMBUSTION ENGINEERING, INC., WINDSOR, CONN. NUCLEAR DIV.
HWOCR, 1000-Mwe nuclear power plant preliminary conceptual design: economic analysis, 20: 36454 (AI-CE-Memo-6(Vol.1))
HWOCR, 1000-Mwe nuclear power plant preliminary conceptual design: plant description, 20: 36455 (AI-CE-Memo-6(Vol.2))
Prog. rpt. on advanced BONUS core development, 3–5/65, 20: 36460 (CEND-244)
Prog. rpt. on advanced BONUS core development, 6–9/65, 20: 36461 (CEND-255)

COMITATO NAZIONALE PER L'ENERGIA NUCLEARE, ROME (ITALY).
Automatic systems applied to neutron spectrometry, 20: 35759 (RT-EL-(66)2)
Circular polarization measurements in γ-γ perturbed angular correlations, 20: 36175 (RT-FI-(66)8)

COMMISSARIAT A L'ENERGIE ATOMIQUE, CHUSCLAN (FRANCE). CENTRE DE PRODUCTION DE PLUTONIUM DE MARCOULE.
Reactors G2/G3: residual power of the fuel elements, 20: 36459 (CEA-R-3004)

COMMISSARIAT A L'ENERGIE ATOMIQUE, FONTENAY-AUX-ROSES (FRANCE). CENTRE D'ETUDES NUCLEAIRES.
Application of paper chromatography to determination of elements in minerals and rocks, 20: 35389 (CEA-R-2791)
Study of the pulsation of ion accelerator furnishing 20-nanosecond pulses, 20: 35953 (CEA-R-2936)

COMMISSARIAT A L'ENERGIE ATOMIQUE, GRENOBLE (FRANCE). CENTRE D'ETUDES NUCLEAIRES.
Activation analysis studies. Counting of short half-life radionuclides. I. A and B, 20: 35392 (CEA-R-2980)
Contribution to the determination of Sb, Ag, Cu, Ga, Mo, and Zn using 14-Mev neutron activation, 20: 35390 (CEA-R-2965)
Spectrographic determination of silicon in uranium–carbon–silicon alloys, 20: 35391 (CEA-R-2966)
Study and construction of multichannel beta spectrometer with uniform magnetic field, 20: 35741 (CEA-R-2950)
Study of the ρ, β, and Λ parameters of a light-water reactor, 20: 36424 (CEA-R-2883)

COMMISSARIAT A L'ENERGIE ATOMIQUE, PARIS (FRANCE).
Mathematical model for cost of maritime transport, 20: 36511 (CEA-R-3022)

COMMISSARIAT A L'ENERGIE ATOMIQUE, SACLAY (FRANCE). CENTRE D'ETUDES NUCLEAIRES.
Adsorption studies in a fluorinating atmosphere, 20: 35846 (CEA-R-2932)
Effect of γ radiation and of thermal neutrons on high-resistivity P and N silicon, 20: 35806 (CEA-R-2918)
Gamma-gamma method. Apparatus for on-the-spot measurement of uranium ore densities, 20: 35654 (CEA-R-2919)
Gamma radiation in space and in atmosphere, 20: 36095 (CEA-R-2939)
Measurements in Pu L x-ray-emission spectrum using electron probe microanalyzer, 20: 35994 (CEA-R-2921)
Processing of data issued from a γ spectrometer, 20: 35742 (CEA-R-2991)
Theoretical study of a random process derived from a Poisson process by division, 20: 35714 (CEA-R-2907)

CONNECTICUT LIGHT AND POWER CO., HARTFORD.
Millstone Nuclear Power Station, 20: 36484 (NP-16147(Vol.1))
Millstone Nuclear Power Station, 20: 36485 (NP-16147(Vol.2))

COURANT INST. OF MATHEMATICAL SCIENCES, NEW YORK UNIV., N. Y.
Coastal refraction of VLF waves, 20: 36107 (NYO-1480-55)

CULHAM LAB., UNITED KINGDOM ATOMIC ENERGY AUTHORITY, ABINGDON (ENGLAND).
Bibliography of conferences on plasma physics and nuclear fusion research, 20: 36285 (NP-16154)
Containment of a CUSP plasma, 20: 36277 (CLM-R-57)
Phoenix II injector and burial line commissioning, 20: 36279 (CLM-R-59)
Steady-state model of CUSP losses, 20: 36278 (CLM-R-58)

D

DANISH ATOMIC ENERGY COMMISSION, RISOE. RESEARCH ESTABLISHMENT.
Electricity directly from atomic energy, 20: 36016 (RISO-M-399)

DENVER RESEARCH INST., UNIV. OF DENVER, COLO.
Prog. rpt. on phase equilibria of Nb–W–Hf and Nb–W–Zr alloy system, 6/66, 20: 35885 (DRI-1092-232)

DEPARTMENT OF ATOMIC ENERGY, BOMBAY (INDIA).
Prog. rpt., annual, 1965, 20: 36539 (NP-16171)

DEUTSCHES ELEKTRONEN-SYNCHROTRON, HAMBURG (WEST GERMANY).
Can current operators determine a complete theory, 20: 36062 (DESY-66/14)
Coherent bremsstrahlung and pair production in diamond crystal, 20: 36026 (DESY-66/15)
Influence of absorption corrections on peripheral photoproduction processes, 20: 36025 (DESY-66/9)
Measurement of electromagnetic cascades and their production of neutrons, 20: 36347 (DESY-66/13)

DIVISION OF BIOLOGY AND MEDICINE (AEC), WASHINGTON, D. C.
Aeroradioactivity survey and geology of Puerto Rico, 20: 35643 (CEX-61.7.2)

DIVISION OF RAW MATERIALS (AEC), WASHINGTON, D. C.
Erosion control of U mill tailing project, 20: 36535 (RMO-3005(Suppl.))

DU PONT DE NEMOURS (E. I.) & CO., AIKEN, S. C. SAVANNAH RIVER LAB.
Airborne activity confinement systems in Savannah River Plant reactor buildings, 20: 35608 (DP-MS-66-52)
Curium process development. I., 20: 35567 (DP-1009)
Development and applications of thermoluminescent dosimeters, 20: 35744 (DP-MS-66-29)
Prog. rpt. on USAEC-AECL cooperative program, 5/66, 20: 35835 (DPST-66-83-5)
Role of dislocations in transgranular stress-corrosion cracking of austenitic stainless steels, 20: 35847 (DP-1008)
Stress-corrosion cracking of carbon steel in simulated waste solutions, 20: 35848 (DP-1023)

E

EDGERTON, GERMESHAUSEN AND GRIER, INC., BOSTON, MASS.
Neutron and gamma dosimetry measurements at AFRRI-DADA TRIGA reactor, 20: 36523 (AD-635819)
ELECTRO-OPTICAL SYSTEMS, INC., PASADENA, CALIF.
Analysis of potential secondary experiments for solar-thermionic flight test vehicle. II., 20: 35983 (N-66-17619)
ELSINORE SHIPBUILDING AND ENGINEERING CO., LTD. (DENMARK).
Design study of experimental loop with model of DOR coolant channel in full size, 20: 36409 (RISO-123)
ERLANGEN-NUERNBERG UNIV. (WEST GERMANY). INSTITUT FUER STRAHLENKUNDE.
Film dosimetry of β rays, 20: 35737 (BMWF-FBK-65-08)
Measurement of ion dose for etalonstion in film dosimetry, 20: 35736 (BMWF-FBK-65-07)
EUROPEAN-AMERICAN NUCLEAR DATA COMMITTEE.
Compilation of EANDC requests, 20: 36158 (EANDC-55(U))
EUROPEAN ATOMIC ENERGY COMMUNITY.
Determination of chlorine and sulfur in terphenyls by chemical analysis, 20: 35393 (EUR-2952.i)
Prog. rpt. on Ardennes nuclear power plant, annual, 1965, 20: 36465 (EUR-2962.f)
Prog. rpt. on Thorium High Temperature Reactor, 1965, 20: 36467 (EUR-3000.e)
RDMM: code for fast neutron spectra determination by activation analysis, 20: 35745 (EUR-2985.e)
Thorium Orgel-type reactor, 20: 36466 (EUR-2995.e)
EUROPEAN ATOMIC ENERGY COMMUNITY, ISPRA (ITALY). JOINT NUCLEAR RESEARCH CENTER.
Determination of chlorine and sulfur in terphenyls by chemical analysis, 20: 35393 (EUR-2952.i)
RDMM: code for fast neutron spectra determination by activation analysis, 20: 35745 (EUR-2985.e)
Thorium Orgel-type reactor, 20: 36466 (EUR-2995.e)
EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH, GENEVA (SWITZERLAND).
$SU_2 \rightarrow SU_3 \rightarrow SU_6$, 20: 36060 (CERN-66-19)

F

FLORIDA POWER AND LIGHT CO.
Turkey Point Nuclear Generating Units Nos. 3 and 4. Description of site and environment, 20: 36481 (NP-16146(Vol.1))
Turkey Point Nuclear Generating Units Nos. 3 and 4. Plant design description and safety analysis, 20: 36482 (NP-16146(Vol.2))
Turkey Point Nuclear Generating Units Nos. 3 and 4. Plant design description and safety analysis, 20: 36483 (NP-16146(Vol.3))
FRANKLIN GNO CORP., WEST PALM BEACH, FLA.
Comparative merits of radioisotope and machine sources of x radiation for aerospace applications, 20: 35812 (ORO-647)
FRANKLIN INST. RESEARCH LABS., PHILADELPHIA, PA.
X-ray investigations on the structure of evaporated films, 20: 35892 (NYO-3347-1)

G

GENERAL DYNAMICS/ASTRONAUTICS, SAN DIEGO, CALIF.
Radiation shielding for Centaur aft bulkhead, 20: 36349 (N-66-18473)
GENERAL DYNAMICS CORP., SAN DIEGO, CALIF. GENERAL ATOMIC DIV.
Accuracy of resonance parameters from combined area and self-indication measurements, 20: 36160 (GA-7060)
Calculation of resonance absorption in doubly heterogeneous media, 20: 36429 (GA-7077)
Characteristics of large reactivity insertions in a high-performance TRIGA U–Zr hydride core, 20: 36527 (CONF-650413, pp 398-419)
ELBOW: fuel element bowing code, 20: 36446 (GAMD-6334)
Feasibility and application of an accelerator booster, 20: 36528 (CONF-650413, pp 473-83)
Influence of neutron cross sections on thermal reactor spectra, 20: 36428 (GA-7072)
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Neutron scattering by hydrogeneous moderators, 20: 36139 (GA-7055)
Prog. rpt. on applications of neutron activation analysis in scientific crime detection, 11/64–12/65, 20: 35394 (GA-7041)
Prog. rpt. on integral neutron thermalization, 1–3/66, 20: 36140 (GA-7091)
Prog. rpt. on TARGET, program for a 1000-Mw(e) high-temperature gas-cooled reactor, 3–5/64, 20: 36468 (GA-5366)
Time-of-flight measurement of neutron spectrum from spherical ^{235}U fast reactor, 20: 36430 (GA-7091(App.C))
GENERAL ELECTRIC CO., CINCINNATI, OHIO. NUCLEAR MATERIALS AND PROPULSION OPERATION.
Design study for high-temperature, uncooled, articulating control rod, 20: 35859 (CONF-660606-9)
GENERAL ELECTRIC CO., PHILADELPHIA, PA. POWER TRANSMISSION DIV.
Physical processes in the cathode region of an arc, 20: 36275 (AD-636160)
GENERAL ELECTRIC CO., PLEASANTON, CALIF. VALLECITOS ATOMIC LAB.
Large reactor excursions starting at high temperature, 20: 36399 (CONF-650413, pp 361-70)
GENERAL ELECTRIC CO., SAN JOSE, CALIF. ADVANCED PRODUCTS OPERATION.
Design and irradiation experience with capsules for long, ceramic fuel elements, 20: 36470 (GEAP-4870)
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GENERAL ELECTRIC CO., SAN JOSE, CALIF. ATOMIC POWER EQUIPMENT DEPT.
Calculation of cell disadvantage factor in cylindrical geometry, 20: 36423 (APED-4335)
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Stainless steel as canning materials for steam cooled reactors, 20: 35840 (KR-89, pp 131-52)
GENERAL ELECTRIC CO., SAN JOSE, CALIF. VALLECITOS ATOMIC LAB.
Chemistry of ESADE-VBWR nuclear superheat loop, 20: 36469 (GEAP-4813)
GENERAL ELECTRIC CO., SCHENECTADY, N. Y. ATOMIC MOTOR PRODUCT SECTION.
High-frequency linear induction electromagnetic pump, 20: 35607 (CNLM-5354(Supplis. 1 and 2))
GEOLOGICAL SURVEY, WASHINGTON, D. C.
Aeroradioactivity survey and geology of Puerto Rico, 20: 35643 (CEX-61.7.2)
GOETTINGEN UNIV. (WEST GERMANY). GEOPHYSIKALISCHES INSTITUT.
Latitude dependence of PC-type micropulsations, 20: 36104 (NBS-8815, pp 32,1-13)
GOSUDARSTVENNYI KOMITET PO ISPOL'ZOVANIYU ATOMNOI ENERGII SSSR, MOSCOW. INSTITUT TEORETICHESKOI I EKSPERIMENTAL'NOI FIZIKI.
Interactions at high energy (theory of complex moments and experiment), 20: 36074 (ITEF-417)
Investigation of charge-exchange $\pi^- + p \rightarrow \pi^0 + n$ reaction at 2.8 Bev/c, 20: 36032 (ITEF-401)
Mass formulas for particle with spin of $1^1/_2$ in broken SU(3) symmetry, 20: 36031 (ITEF-398)
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Problem of maximum power of reactor, 20: 36475 (ITEF-416)
Quantum field theory with indefinite metrics in Hilbert space, 20: 36073 (ITEF-395)
GRENOBLE UNIV. (FRANCE).
Study of the ρ, β, and Λ parameters of a light-water reactor, 20: 36424 (CEA-R-2883)
GRENOBLE UNIV. (FRANCE). FACULTE DES SCIENCES.
Study and construction of multichannel beta spectrometer with uniform magnetic field, 20: 35741 (CEA-R-2950)

H

HARTFORD ELECTRIC LIGHT CO., CONN.
Millstone Nuclear Power Station, 20: 36484 (NP-16147(Vol.1))
Millstone Nuclear Power Station, 20: 36485 (NP-16147(Vol.2))
HELIOTEK, SYLMAR, CALIF.
Development of an improved radiation-resistant solar cell, 20: 36015 (N-66-18407)
HITTMAN ASSOCIATES, INC., BALTIMORE, MD.
PM-3A type 2 core safeguards analyses, 20: 36472 (HIT-3616-4)

I

IIT RESEARCH INST., CHICAGO, ILL.
Prog. rpt. on reactor containment, 4–5/66, 20: 36406 (IITRI-578P21-20)
INSTITUT ATOMNOI ENERGII, GOSUDARSTVENNYI KOMITET PO

ISPOL'ZOVANIYU ATOMNOI ENERGII SSSR, MOSCOW.
Production of hot plasma in Orga-II by injection of fast hydrogen atoms in magnetic trap, 20: 36292 (KFK-tr-193)
INSTITUT DE PHYSIQUE DU GLOBE, PARIS (FRANCE).
Ultralow-frequency effects provoked by high-altitude nuclear explosions, 20: 36106 (NBS-8815, pp 35.1-23)
INSTITUT DE SOUDURE, PARIS (FRANCE).
Prog. rpt. on gas cutting and single J grooving by oxyacetylene blowpipe, annual, 1965, 20: 35860 (EURAEC-1651)
INSTITUTE FOR NUCLEAR STUDY, TOKYO UNIV. (JAPAN).
Measurement of γ rays from (p,2n) reactions on vibrational nuclei, 20: 36166 (INSJ-98)
INSTITUTE OF NUCLEAR PHYSICS, KRAKOW (POLAND).
Automation of Moessbauer spectrometer, 20: 35748 (INP-457/PL)
INSTITUTE OF NUCLEAR RESEARCH, WARSAW (POLAND).
Cross sections for production of isomeric pair ^{58g,58m}Co in ^{59}Co(n,2n)^{58}Co reaction, 20: 36164 (INR-668/I/PH)
Cross sections of fission of ^{239}Pu by neutrons at 13.1 to 15.4 Mev, 20: 36165 (INR-688/I/PH)
Mercury-boiling fused-salt fast reactor "WARS", 20: 36474 (INR-706/C)
Possibility of producing ^{15}N during production of sulfuric acid by nitrose method, 20: 35569 (INR-674/XVI/J)
X-ray studies of neutron bombardment influence on real structure of germanium, 20: 36357 (INR-684/II/PH)
INSTITUTE OF RADIATION PHYSICS, HELSINKI (FINLAND).
Gamma spectrometric determinations of ^{137}Cs and potassium in Finnish milk, 20: 35397 (SFL-A2)
INSTITUTO DE ENERGIA ATOMICA, SAO PAULO (BRAZIL).
Absolute measurements of the activity of radionuclides. I., 20: 35747 (IEA-114)
Application of ion exchange resins to separation of carrier-free fission products, 20: 35587 (IEA-101)
Diffusion parameters in water for thermal neutrons by pulsed source method, 20: 36141 (IEA-107)
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New method of utilization of NaI(Tl) crystals in detection of high-energy gamma rays, 20: 35746 (IEA-108)
Separation of carrier-free ^{32}P from irradiated sulfur, 20: 35568 (IEA-103)
INSTITUTT FOR ATOMENERGI, HALDEN (NORWAY).
In-core instrumentation developed for fuel testing at HBWR, 20: 36480 (KR-89, pp 291-316)
INSTITUTT FOR ATOMENERGI, KJELLER (NORWAY).
Aluminum as canning material, 20: 35838 (KR-89, pp 97-111)
Prog. rpt. on NORA project, 4–6/66, 20: 36530 (IAEA-3498-14)
Study of space-dependent transfer functions, 20: 36529 (CONF-660624-1)
INSTITUTUL DE FIZICA ATOMICA, ACADEMIA R. P. R., BUCHAREST (ROMANIA).
Gamma spectra following decay of ^{86}Br, ^{87}Br, and ^{88}Br, 20: 36163 (IFA-NR-24)
General solution of one-channel scattering singular integral equations, 20: 36071 (IFA-FT-58)
Methods for detecting radioisotopes in cooling circuit of water-cooled heterogeneous reactors, 20: 36408 (NP-16006)
Representation of infinitesimal unitary groups by infinitesimal canonical transformations, 20: 36072 (IFA-FT-59)
INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA (AUSTRIA).
Bibliography on neutron detectors, 20: 35761 (STI-PUB-21-18)
Estimating integrated thermal power produced in power reactor (photovoltaic monitor), 20: 36486 (NP-16188)
Symposium on criticality control of fissile materials, Stockholm, 11/65, 20: 35669 (STI-PUB-114)
INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS, TRIESTE (ITALY).
Algebra of currents and p-wave non-leptonic hyperon decays, 20: 36027 (IC-66/73)
Algebraic formulation of dynamical models, 20: 36070 (IC-66/87)
Calculation of the form factors in K_{β} decay, 20: 36028 (IC-66/74)
Discrete series of hermitian representations of Lie algebra of U(p,q), 20: 36065 (IC-66/71)
Eigenfunction expansions associated with second-order invariant operator on hyperboloids and cones, 20: 36161 (IC-66/62)
Factorization of Einstein's formalism into a pair of quanternion field equations, 20: 36067 (IC-66/81)
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Quark model and elastic baryon-baryon scattering, 20: 36029 (IC-66/76)
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Tests of models of elementary particles, 20: 36063 (IC-66/65)
ISRAEL ATOMIC ENERGY COMMISSION, YAVNE. SOREQ NUCLEAR RESEARCH CENTER.
Differentiation between ErI and ErII spectra using only d-c arc as excitation source, 20: 35995 (IA-1037)
ISTITUTO SUPERIORE DI SANITA', ROME (ITALY). LABORATORI DI FISICA.
Reactions (e,e′p), (e,e′n) and (e,e′α) studied using electron synchrotron beam, 20: 36167 (ISS-66/20)
SAN 64: program for spatial reconstruction of events in diffusion chamber. I., 20: 35749 (ISS-66/11)
SAN 64: program for spatial reconstruction of events in diffusion chamber. II., 20: 35750 (ISS-66/12)
SAN 64: program for spatial reconstruction of events in diffusion chamber. III., 20: 35751 (ISS-66/13)
SAN 64: program for spatial reconstruction of events in diffusion chamber. IV., 20: 35752 (ISS-66/14)

J

JET PROPULSION LAB., CALIF. INST. OF TECH., PASADENA.
Analysis of potential secondary experiments for solar-thermionic flight test vehicle. II., 20: 35983 (N-66-17619)
JOINT INST. FOR NUCLEAR RESEARCH, DUBNA (USSR). LAB OF HIGH ENERGY.
Bremsstrahlung of electrons with E = 2.4 Bev, 20: 36034 (JINR-P-2744)
JOINT INST. FOR NUCLEAR RESEARCH, DUBNA (USSR). LAB. OF NEUTRON PHYSICS.
Calculation of electron acceleration up to 30 Mev by rectangular resonators in microtron, 20: 35955 (JINR-P-2706)
Investigation of parameters of two types of supectometer stabilization systems, 20: 35753 (JINR-P-2707)
Parameters of ^{239}Pu levels, 20: 36168 (JINR-P-2713)
Proton polarization from the ^{12}C(^{3}He,p_0)^{14}N reaction, 20: 36169 (JINR-P-2725)
JOINT INST. FOR NUCLEAR RESEARCH, DUBNA (USSR). LAB OF NUCLEAR PROBLEMS.
Determination of synchrocyclotron accelerating voltage using intensity dependence on frequency modulation, 20: 35956 (JINR-P-2730)
Measurement of energy of (2P-1S) transitions in muonic atoms of elements from S to Cr, 20: 35996 (JINR-P-2735)
Methods of stereoscopic camera adjustment, 20: 35754 (JINR-P-2727)
Phase-shift analysis of nucleon-nucleon scattering at 400 Mev, 20: 36033 (JINR-E-2743)
JOINT INST. FOR NUCLEAR RESEARCH, DUBNA (USSR). LAB OF NUCLEAR REACTIONS.
Measurement of ^{95}Zr and ^{95}Nb mixture by Ge(Li) detectors, 20: 36170 (JINR-P-2739)
JOINT INST. FOR NUCLEAR RESEARCH, DUBNA (USSR). LAB OF THEORETICAL PHYSICS.
Electromagnetic form factors of nucleons and minimal interaction of quarks, 20: 36035 (JINR-P-2757)
Hypothesis of conserved tensor currents and SU(6) group, 20: 36076 (JINR-P-2696)
Symmetry breaking quasi-particle method for baryons and for quarks. I., 20: 36075 (JINR-E-2714)

K

KERNFORSCHUNGSANLAGE, JUELICH (WEST GERMANY).
Prog. rpt. on Thorium High Temperature Reactor, 1965, 20: 36467 (EUR-3000.e)
KERNFORSCHUNGSZENTRUM, KARLSRUHE (WEST GERMANY). INSTITUT FUER ANGEWANDTE REAKTORPHYSIK.
Prompt supercritical power excursions in fast reactors, 20: 36497 (EURFNR-68F)
KERNFORSCHUNGSZENTRUM, KARLSRUHE (WEST GERMANY). INSTITUT FUER NEUTRONENPHYSIK UND REAKTORTECHNIK.
Interpolation formula for self-shielding factor, 20: 36431 (KFK-384)
KNOLLS ATOMIC POWER LAB., SCHENECTADY, N. Y.
Disadvantage factors in close-packed lattices, 20: 36426 (CONF-660606-11)
Fatigue crack propagation in low-carbon steels, 20: 35896 (TID-23138)
Pulsed neutron reactivity measurements, 20: 36425 (CONF-660606-10)
KUNGLIGA VETENSKAPSAKADEMIEN, KIRUNA (SWEDEN). GEOFYSISKA OBSERVATORIET.
Polarization of giant pulsations at Kiruna, 20: 36103 (NBS-8815, pp 30.1-10)

L

LABORATOIRE DE L'ACCELERATEUR LINEAIRE, UNIV. DE PARIS, ORSAY (FRANCE).
Prog. rpt., 10/65–4/66, 20: 35958 (LAL-1159)
LABORATOIRE DE RECHERCHES SUR LA PHYSIQUE DES PLASMAS, LAUSANNE (SWITZERLAND).
High-frequency rotation magnetic field, 20: 36281 (LRP-26/66)
Stability of dense plasma confined by rotating magnetic field, 20: 36280 (LRP-25/66)
LABORATORI NAZIONALI DI FRASCATI, COMITATO NAZIONALE PER L'ENERGIA NUCLEARE (ITALY).
Asymmetry ratios in photoproduction of π^+ by linearly polarized γ rays in the energy range 200 to 400 Mev, 20: 36037 (LNF-66/23)
Eta photoproduction cross section for incident photon energies 800 to 1000 Mev, 20: 36036 (LNF-66/20)
Magnetic detector for Adone, 20: 35959 (LNF-66/18)
LAWRENCE RADIATION LAB., UNIV. OF CALIFORNIA, BERKELEY.
A_1 and K** (1320) phenomena: kinematic enhancements or mesons, 20: 36044 (UCRL-16744)
Beam diagnostics and instrumentation, 20: 35972 (UCRL-16792)
Improved correlation for the heats of formation of inorganic compounds, 20: 35482 (UCRL-16865)
Mechanisms of deformation in dispersion-hardened alloys, 20: 35898 (UCRL-16803)
Multi-channel dynamics in strip approximation, 20: 36045 (UCRL-16874)
Nuclear masses and deformations, 20: 36177 (UCRL-11980)
Prog. rpt. on bevatron operation and development, 7–9/65, 20: 35970 (UCRL-16554)
Prog. rpt. on bevatron operation and development, 10–12/65, 20: 35971 (UCRL-16741)
Regenerative beam extraction, 20: 35973 (UCRL-16793)
Semiautomatic infrared analyzer for serum triglycerides and cholesteryl esters, 20: 35400 (UCRL-16880)
Solid-state counters for immediate analysis during column chemistry, 20: 35764 (UCRL-16869)
LAWRENCE RADIATION LAB., UNIV. OF CALIFORNIA, LIVERMORE.
Data on announced nuclear detonations by all nations through 1965, 20: 35670 (UCRL-14786)
Improved shipping container for fissile material, 20: 35671 (UCRL-14903)
Nuclear cratering experience at the Pacific Proving Grounds, 20: 35605 (UCRL-12172)
One-dimensional magnetohydrodynamics code, 20: 36086 (UCRL-14931)
Reaction (n,2n) induced by 14.5-Mev neutrons, 20: 36178 (UCRL-14575)
Subsurface effects measurements, Project Pre-Schooner II, 20: 35604 (PNE-515)
Theoretical considerations, design, and evaluation of cascade impactor, 20: 35399 (UCRL-14440(Rev.1))
LOS ALAMOS SCIENTIFIC LAB., UNIV. OF CALIFORNIA, N. MEX.
Aerosol produced from burning sodium and plutonium, 20: 35668 (LA-3491)
Critical nucleat boiling of liquid helium in simulated wire-wound magnet, 20: 36122 (LA-DC-7801)
Current status of archeology at Nevada Test Site and Nuclear Rocket Development Station, 20: 35640 (LA-3520)
Disturbance of capacitive liquid level gages by nuclear radiation, 20: 35807 (LA-DC-7654)
Dose rate measurements on the Kiwi B-4D-202 and Kiwi B-4E-301 reactors, 20: 36515 (LA-3447)
Fault-protection system for linac RF amplifiers, 20: 35957 (LA-DC-7775)
He II persistent current gyro element for inertial navigation, 20: 36120 (LA-DC-7793)
Liquid helium technology in nuclear polarization experiments, 20: 36121 (LA-DC-7794)
Measurement of alpha phase Pu in Pu-1 wt % gallium alloy by electrical resistivity, 20: 35890 (LA-3332)
Particle-in-cell method for calculation of the dynamics of compressible fluids, 20: 36085 (LA-3466)
Pressure oscillations induced by forced-convection heating of dense H, 20: 36123 (LA-DC-7806(Rev.))
Radiation damage production of interstitial defects in ionic halide crystals, 20: 35932 (LA-3501)
Radiation measurements of effluent from PHOEBUS 1A-321 reactor, 20: 36514 (LA-3396)
Response of selected neutron monitoring instruments to several types of neutron sources, 20: 35756 (LA-DC-7702)
Silver counter: detector for bursts of neutrons, 20: 35755 (LA-3498)
Transfer function measurements in nuclear rocket program, 20: 36516 (LA-DC-7781)
Tributyl phosphate extraction of U(VI) trichloroacetate, 20: 35588 (LA-3503)
LYON UNIV. (FRANCE). INSTITUT DE PHYSIQUE NUCLEAIRE.
Tubular dynamic pinch, 20: 36282 (LYCEN-6623)

M

MAINZ UNIV. (WEST GERMANY).
Distribution of nuclear charge in fission chain of ^{239}U, 20: 36171 (NP-16155)
MAINZ UNIV. (WEST GERMANY). NATURWISSENSCHAFTLICHE FAKULTAET.
Electrochemical behavior of U as cathode and electrolytic dissolution of fission products, 20: 35589 (NP-16170)
MARYLAND UNIV., COLLEGE PARK. DEPT. OF PHYSICS AND ASTRONOMY.
Measurement processing for charged SIGMA production reactions near 1 Bev/c, 20: 36041 (ORO-2540-90)
MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Applications of mathematical methods to nuclear engineering, 20: 36462 (CONF-650413, pp 1-27)
MIAMI UNIV., CORAL GABLES, FLA. DEPT. OF PHYSICS.
Production and propagation of plasmoids in nonlinear Alfven wave, 20: 36291 (TID-23221)
MICHIGAN UNIV., ANN ARBOR.
Nonlinear study of reactor systems with linear feedback, 20: 36395 (CONF-650413, pp 28-37)
MINNESOTA UNIV., MINNEAPOLIS. LINEAR ACCELERATOR AND TANDEM VAN DE GRAAFF LAB.
Accelerator progress, 20: 35968 (TID-22971, pp 1-40)
Experimental instrumentation, 20: 35763 (TID-22971, pp 141-83)
Experimental program, 20: 36176 (TID-22971, pp 41-140)
Prog. rpt. on linear accelerator and Tandem Van de Graaff laboratory research, annual, 8/64–7/65, 20: 35967 (TID-22971)
MOUND LAB., MIAMISBURG, OHIO.
Alpha and neutron source development, 20: 35570 (MLM-1299, pp 17-21)
Isotope separation and purification, 20: 35827 (MLM-1299, pp 22-33)
Prog. rpt., 10/65, 20: 35828 (MLM-1300)
Prog. rpt., 9/65, 20: 35536 (MLM-1299)
Radioelements, 20: 35537 (MLM-1299, pp 7-16)

N

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, CLEVELAND, OHIO. LEWIS RESEARCH CENTER.
Influence of time on vacuum vaporization rate and surface compositional stability of Ta carbide–Hf carbide above 2000°C, 20: 35476 (NASA-TN-D-3503)
Lewis proton shielding code, 20: 36348 (N-66-17566)
Program for calculation of neutron ages from experimental activation data, 20: 36142 (NASA-TM-1260)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, GREENBELT, MD. GODDARD SPACE FLIGHT CENTER.
Bibliography on particles and fields research, 20: 35985 (NASA-SP-7026)
Excitation of atomic hydrogen by protons, 20: 35997 (N-66-18395)
Thermal annealing of radiation-damaged silicon, 20: 35808 (N-66-18378)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, LANGLEY STATION, VA. LANGLEY RESEARCH CENTER.
Oxidation of Mo, 20: 35850 (N-66-17887)
Production and propagation of plasmoids in nonlinear Alfven wave, 20: 36291 (TID-23221)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, MOFFETT FIELD, CALIF. AMES RESEARCH CENTER.
Electron densities and scale heights in the topside ionosphere, 20: 36096 (NASA-SP-3027)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, NEW YORK. GODDARD INST. FOR SPACE STUDIES.
Presupernova evolution (neutrino stars), 20: 35984 (N-66-18361)
NATIONAL BUREAU OF STANDARDS, BOULDER, COLO. CENTRAL RADIO PROPAGATION LAB.
Conference on ultralow-frequency electromagnetic fields, Boulder, Colorado, 8/64, 20: 36097 (NBS-8815)
Continuous pulsations of the earth's electromagnetic field and dynamics of magnetosphere, 20: 36105 (NBS-8815, pp 34.1-4)
Geomagnetic pulsations associated with auroral zone disturbance phenomena, 20: 36102 (NBS-8815, pp 28.1-28)
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(NBS-8815, pp 27.1-19)
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Ultralow-frequency effects provoked by high-altitude nuclear explosions, 20: 36106 (NBS-8815, pp 35.1-23)

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLO.
Conference on ultralow-frequency electromagnetic fields, Boulder, Colorado, 8/64, 20: 36097 (NBS-8815)
Continuous pulsations of the earth's electromagnetic field and dynamics of magnetosphere, 20: 36105 (NBS-8815, pp 34.1-4)
Geomagnetic pulsations associated with auroral zone disturbance phenomena, 20: 36102 (NBS-8815, pp 28.1-28)
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Long-period giant pulsations of geomagnetic field, 20: 36098 (NBS-8815, pp 18.1-6)
Polarization of giant pulsations at Kiruna, 20: 36103 (NBS-8815, pp 30.1-10)
Telluric current studies of auroral zone micropulsation, 20: 36101 (NBS-8815, pp 27.1-19)
Transmission of solar corpuscular energy to magnetosphere and ionosphere, 20: 36099 (NBS-8815, pp 19.1-3)
Theory of Dst main phase and associated phenomena, 20: 36100 (NBS-8815, pp 20.1-3)
Ultralow-frequency effects provoked by high-altitude nuclear explosions, 20: 36106 (NBS-8815, pp 35.1-23)

NAVAL RADIOLOGICAL DEFENSE LAB., SAN FRANCISCO, CALIF.
Calculated activities, exposure rates, and γ spectra for unfractionated fission products, 20: 36181 (USNRDL-TR-1009)
Electrochemical corrosion studies of SNAP container materials, 20: 35851 (USNRDL-TR-1036)
Energy levels of ^{127}I, 20: 36153 (AD-635252)
Temperature compensating preamplifier for driving long coaxial lines in scintillation spectroscopy applications, 20: 35729 (AD-635882)

NETHERLANDS'-NORWEGIAN REACTOR SCHOOL, KJELLER (NORWAY). ADVANCED STUDY INST.
Aluminum as canning material, 20: 35838 (KR-89, pp 97-111)
Comparison between vibratory compacted, swaged, and pellet filled elements, 20: 35861 (KR-89, pp 181-96)
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NEVIS LABS., COLUMBIA UNIV., IRVINGTON-ON-HUDSON, N. Y.
Radiative decay of muon, 20: 36021 (AD-635846)

NEW MEXICO STATE UNIV., UNIVERSITY PARK.
Experimental study of radio-frequency plasmoids, 20: 36272 (AD-632670)

NEW MEXICO UNIV., ALBUQUERQUE.
Pressure oscillations induced by forced-convection heating of dense H, 20: 36123 (LA-DC-7806(Rev.))

NEW YORK UNIV., N. Y. DEPT. OF PHYSICS.
Prog. rpt. on use of atomic beams as probe for studying low-density plasmas, final, 6/59–9/65, 20: 36287 (NYO-2397-2)

NORTH AMERICAN AVIATION, INC., DOWNEY, CALIF.
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SOCIETE D'ENERGIE NUCLEAIRE FRANCO-BELGE DES ARDENNES, CHOOZ-LEZ-GIVET (FRANCE).
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Because of problems involving the mechanical preparation of this index, all accent marks are omitted. The following changes in spelling have been introduced to reduce some of the confusion which might result from omitting the accents:

ä	becomes	ae
ö		oe
ø		oe
ü		ue (except in transliterated Chinese names)

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65-08)
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PATTERSON, H. Wade, Report on a radiation survey made in Egypt, India, and Ceylon in January 1963, 20: 35648
PAUL, H., Multiple electron scattering in thin foils, 20: 35999 (SGAE-PH-40/1966)
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SUBJECT INDEX

Main entries in this index are generally specific materials, things, and processes. These are followed by modifiers that describe the properties of, and processes applied to, the main entries.

The number preceding the colon is the *NSA* volume number, and the number following is the abstract number. The designation (R) following the abstract number indicates that the abstract is of a progress report; (P) indicates a patent; and (T) indicates a translation. Abstracts for reports other than progress reports carry no letter designation. References to report numbers, where appropriate, are included after the abstract number of the citation. Published literature (journal article or book) is identifiable by the absence of a report number.

The user should bear in mind that the ideas presented in the original literature, rather than key words, have been indexed. The indexers have tried to select what seemed the most probable and logical place to look for typical information. Since it is not possible to anticipate where a user would look for information, numerous cross references are included in cumulative indexes to assist him in his search.

Experience in using an index of this type will be the best guide in obtaining the desired information, and a consideration of synonymous or closely related terms will prove valuable.

Information must be so indexed as to be of the greatest use to the greatest number of users. This requires that a topic be indexed to headings that most specifically describe it and not ordinarily to the headings that describe its ultimate use, nor to the general class headings that include the specific headings. For example, information on the treatment of thyroid disease with I-131 would be indexed under Thyroid Gland and under Iodine Isotopes I-131, but not necessarily under Radiotherapy. A study of the effects of x radiation on hair would be indexed under both X Radiation and Hair. However, the information would not be indexed under the experimental animal, e.g., Rats, unless the report discusses the effects on rat hair as compared with the effect on the hair of other animals.

The broad, general class headings are used only for general information or for comprehensive reports or articles.

Subject Heading Styles

Generally, the direct form of subject entry is used rather than inverted headings, e.g., Amino Acids rather than Acids, Amino; Helium Isotopes He-4 rather than Helium—isotopes He-4 or Helium—He-4 isotopes. Note, however, that in some cases parenthetic modifying terms or inverted headings of the form Neutrons, Fast are used in preference to a direct entry that would result in the scattering of information. Organic compounds are usually entered in the index in the inverted form so that substituted compounds can be listed near the parent compound; e.g., Benzene, Bromo- rather than Bromobenzene. In general, the style of nomenclature used is that of Chemical Abstracts, except that some items listed in that publication as subheadings are elevated to form part of the main heading; e.g., Butyric Acid, Methyl Ester rather than Butyric Acid—methyl ester.

Alphabetization

Main headings are alphabetized word-by-word. A parenthetic qualifier following a main heading is disregarded in alphabetizing unless there are two or more headings identical except for the parenthetic qualifier, in which case the qualifier determines the order. Headings involving Greek letters are arranged as if the names of the letters were spelled out.

Examples:

M-Capture
  see Electron Capture
Magnesium
Magnesium Alloys
Manganese Fluorides
Manganese(II) Fluorides
Mesons
Mesons (π)
Mesons (ρ)
3-Pentanol, 2,4-Dimethyl-
2-Pentanol, 2-Methyl-
2-Pentanol, 4-Methyl-

Nomenclature of Inorganic Compounds

Inorganic compounds are indexed in the direct form, listing cations in the order of increasing valence in the case of polycationic salts of varying valence and in alphabetic order for polycationic salts in which all cations have the same valence; e.g., Sodium Aluminum Silicates and Potassium Sodium Sulfates.

Multicomponent Alloys and Other Systems

Multicomponent alloys, except well-known trade names, are indexed under a main heading in the form "element alloy" for each element in the alloy. The modifier begins with element symbols for each component arranged alphabetically as if the English name for the element were spelled out.

Example: Copper-Gold Alloy is indexed
  Copper Alloys
    Cu-Au...
  Gold Alloys
    Cu-Au...

Well-known alloys such as Zircaloy-2 are indexed directly to the trade name; cross references referring from each component of the alloy to the entry for the trade name appear in cumulative indexes.

Multicomponent systems of non-metallic elements are indexed in a manner similar to alloys except the main heading used contains the word "Systems" in place of "Alloys."

Example: Silicon–Tungsten Systems are indexed
  Silicon Systems
    Si-W...
  Tungsten Systems
    Si-W...

Multicompound systems and mixtures of compounds are indexed under the main heading for each component com-

pound; the modifiers begin with an alphabetical listing of compound formulas.

Example: Lead Titanate–Lead Zirconate is indexed
Lead Titanates
$PbTiO_3$-$PbZrO_3$...
Lead Zirconates
$PbTiO_3$-$PbZrO_3$...,

A mixed system of compounds and elements is indexed using a combined form of the above conventions, e.g., a dispersion of copper and alumina would be indexed

Aluminum Oxides
Al_2O_3-Cu...
Copper Systems
Al_2O_3-Cu..

Physical States and Configurations of Materials

Specification of the physical state, if other than normal, or geometric configuration of the material is included in the modifying phrase, i.e., liquid metals would be indexed to the metal with "liquid" in the modifier, and carbon crucibles would be indexed to Carbon with "crucibles" appropriately placed in the modifier and also to Crucibles if appropriate.

Modifying Phrases

The modifiers appearing under a main heading are written specifically to describe the relation of the item being indexed to that main heading. The modifier, therefore, will generally contain more useful information about that relation than will a title or a phrase written to be used under every main heading assigned to the item. Effort is exerted to begin the modifier with the word judged to be of greatest use to the greatest number of users; this, however, does not obviate the need to consider all modifiers under the main heading(s) of interest.

Modifiers are usually intended to form a meaningful phrase when combined with the main heading. Some are intended to be read following the main heading, e.g., the entry Hydrogen—sorption by charcoal is read "hydrogen sorption by charcoal"; however, as a result of placing the important word first, many modifiers must be arranged for smooth reading, e.g., Formaldehyde—yields in radiolysis of ethyl ether, effects of deuterium on is read "effects of deuterium on formaldehyde yields in radiolysis of ethyl ether" and Uranium—crystal structure of, effect of cooling rate on allotropic transformations in is read "effect of cooling rate on allotropic transformations in crystal structure of uranium." Prepositions are sometimes omitted if no ambiguity results.

Special characters are added to modifiers in the field of physics; if the modifier does not establish the experimental or theoretical character of a reference, a symbol (E), (T), or (E/T) is placed immediately after the modifying phrase and before the journal reference number. The value of this identification has been established by the American Institute of Physics.

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10297	20-35952	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10309	20-36458	Dep. mn. CFSTI $3.00 cy, $0.75 mn
10326	20-35739	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10327	20-35216	J. Cell Biol., 29: 29-36(1966)
10330	20-36276	Dep. mn. CFSTI $1.00 cy, $0.50 mn
BNWL–		
15	20-35713	Dep. mn. CFSTI $1.00 cy, $0.50 mn
200	20-36534	Dep. mn. CFSTI $3.00 cy, $0.75 mn
BNWL-SA–		
307	20-35260	Biol. Bull., 130: 157-69(1966)
516	20-35740	Dep. mn. CFSTI $1.00 cy, $0.50 mn
573	20-35410	Anal. Chem., 38: 1288(1966)
CALT–		
63-19	20-36242	pp 309-13 of Internal Conversion Processes. New York, Academic Press, 1966
63-20	20-36243	pp 315-20 of Internal Conversion Processes. New York, Academic Press, 1966
63-22	20-36244	pp 321-6 of Internal Conversion Processes. New York, Academic Press, 1966
63-24	20-36228	pp 173-82 of Internal Conversion Processes. New York, Academic Press, 1966
68-70	20-36023	Dep. mn. CFSTI $1.00 cy, $0.50 mn
221-19	20-35884	Dep. mn. CFSTI $1.00 cy, $0.50 mn
CAPE–		
979	20-36410	
1279	20-35725	
1294	20-35723	
1352	20-35724	
1358	20-36509	
1390	20-35794	
1392	20-35639	
1395	20-35722	
1396	20-35793	
1397	20-35792	
CEA-R–	**(French)**	
2791	20-35389	Dep. mn
2883	20-36424	Dep. mn
2907	20-35714	Dep. mn
2918	20-35806	Dep. mn
2919	20-35654	Dep. mn
2921	20-35994	Dep. mn
2932	20-35846	Dep. mn
2936	20-35953	Dep. mn
2939	20-36095	Dep. mn
2950	20-35741	Dep. mn
2965	20-35390	Dep. mn
2966	20-35391	Dep. mn
2980	20-35392	Dep. mn
2991	20-35742	Dep. mn
3004	20-36459	Dep. mn
3022	20-36511	Dep. mn
CEA-S–	**(Non-AEC)**	
3	20-36356	Dep. mn
CEAL-TM–		
147	20-35954	Dep. mn. CFSTI $1.00 cy, $0.50 mn
CEND–	**(Misc.)**	
244	20-36460	Dep. mn. CFSTI $5.00 cy, $1.00 mn
255	20-36461	Dep. mn. CFSTI $3.00 cy, $0.75 mn

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CERN–	**(European Organization for Nuclear Research)**	
66-19	20-36060	Dep. mn
CEX–		
61.7.2	20-35643	Dep. mn. CFSTI $1.00 cy, $0.50 mn
CLM-P–	**(British)**	
84	20-36306	Phys. Fluids, 9: 1394-1402(1966)
96	20-36304	Phys. Fluids, 9: 1386-8(1966)
CLM-R–	**(British)**	
57	20-36277	Dep. BIS $0.50. HMSO 2s. 6d.
58	20-36278	Dep. BIS $0.25. HMSO 1s. 2d.
59	20-36279	Dep. BIS $0.30. HMSO 1s. 9d.
CLOR–	**(Polish)**	
46/D	20-35743	Dep. mn
CNLM–	**(Misc.)**	
5354(Suppls. 1&2)	20-35607	Dep. mn. CFSTI $3.00 cy, $0.75 mn
CONF-600702–	**20-36183**	**(2nd All-Union Conference on Nuclear Reactions at Low and Intermediate Energies, Moscow, U.S.S.R., July 21–28, 1960) See AEC-tr-6465**
CONF-631104–	**20-26537**	**(Meeting on the Utilization of Research Reactors, São Paulo, Brazil, Nov. 4–8, 1963) See STI/DOC-57**
10	20-36141	See IEA-107
CONF-640815–	**20-36097**	**(Symposium on Ultra Low Frequency Electromagnetic Fields, Boulder, Colo., Aug. 17–20, 1964) See NBS-8815**
CONF-640818–	**20-35451**	**(Conference on Activation Analysis, Principles and Applications, Glasgow, Scotland, Aug. 1964) New York, Academic Press, 1965**
CONF-650413–	**20-36394**	**(Symposium on Neutron Dynamics and Control, Tucson, Ariz., Apr. 5–7, 1965) Dep. mn. CFSTI $4.50 cy, $2.50 mn**
CONF-650525–	**20-36221**	**(International Conference on the Internal Conversion Process, Nashville, Tenn., May 10–13, 1965) New York, Academic Press, 1966**
CONF-650540–	**(American Industrial Hygiene Assn. Meeting, Houston, Tex., May 4–7, 1965)**	
8	20-35404	Anal. Chem., 38: 1171-5(1966)
CONF-650616–	**(Health Physics Society, Annual Meeting, Los Angeles, June 14–17, 1965)**	
24	20-35492	Health Phys., 12: 923-6(1966)
CONF-650707–	**20-21164**	**(IEEE Annual Conference on Nuclear and Space Radiation Effects, Ann Arbor, Mich., July 12–15, 1965) Trans. Nucl. Sci., NS-12: 1-155(1965)**
21	20-35811	ORAU. Gmelin, AED-CONF-65-152-22
24	20-35810	ORAU
CONF-650804–	**(5th Rare Earth Research Conference, Ames, Iowa, Aug. 30–Sept. 1, 1965)**	
Bk.2	20-36372	ORAU
Bk.4	20-36375	ORAU
Bk.6	20-36382	ORAU
CONF-650826–	**(International Conference on Energetics, Rochester, N. Y., Aug. 18–20, 1965)**	
4	20-35825	ORAU. Gmelin, AED-CONF-65-210-6
CONF-650927–	**(American Physical Society, Honolulu, Hawaii, Sept. 2–4, 1965)**	
7	20-36371	ORAU. Gmelin, AED-CONF-65-222-35
9	20-36219	ORAU. Gmelin, AED-CONF-65-222-38
10	20-36008	ORAU. Gmelin, AED-CONF-65-222-17
12	20-35992	ORAU. Gmelin, AED-CONF-65-222-8

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13	20-35981	ORAU. Gmelin, AED-CONF-65-222-6
CONF-650947–	**20-13506**	**(International Conference on Elementary Particles, Kyoto, Sept. 24–30, 1965) Progr. Theoret. Phys. (Kyoto), 34: Suppl., 1-688(1965)**
3	20-36218	ORAU. Gmelin, AED-CONF-65-317-4
4	20-36061	See COO-264-308
CONF-651005–		**(1st International Symposium on Water Desalination, Washington, D. C., Oct. 3–9, 1965)**
12	20-35627	For translation see AEC-tr-6737
13	20-35852	For translation see AEC-tr-6738
17	20-36507	For translation see AEC-tr-6744
CONF-651015–		**(American Physical Society Meeting, Chicago, Oct. 7, 1965)**
10	20-36220	ORAU. Gmelin, AED-CONF-65-312-11
12	20-36133	ORAU. Gmelin, AED-CONF-65-312-31
CONF-651046–		**(12th National Symposium of the American Vacuum Society, New York, Oct. 1, 1965)**
5	20-35612	ORAU. Gmelin, AED-CONF-65-403-7
CONF-651073–		**(Ion Beam Bombardment and Doping of Semiconductors Conference, Pasadena, Calif., Oct. 25, 1965)**
1	20-35863	See ORNL-TM-1495
CONF-651103–	**20-35669**	**(IAEA Symposium on Criticality Control of Fissile Materials, Stockholm, Nov. 1–5, 1965) See STI-PUB-114**
CONF-651110–		**(American Society of Mechanical Engineers, Annual Winter Meeting, Chicago, Nov. 7–11, 1965)**
26	20-35826	ORAU. Gmelin, AED-CONF-65-327-1
28	20-36019	ORAU. Gmelin, AED-CONF-65-327-5
CONF-651111–	**20-27000**	**(Symposium in Medicine No. 9 Radioactive Pharmaceuticals, Oak Ridge, Tenn., Nov. 1–4, 1965) Dep. mn. CFSTI $5.00 cy, $3.00 mn**
9	20-35823	ORAU. Gmelin, AED-CONF-65-323-12
CONF-651113–		**(18th Annual Conference on Engineering in Medicine and Biology, Philadelphia, Nov. 10–12, 1965)**
3	20-35382	ORAU. Gmelin, AED-CONF-65-322-2
CONF-651114–		**(Annual Meeting of the Soil Science Society of America, Columbus, Ohio, Nov. 1–4, 1965)**
2	20-35239	ORAU. Gmelin, AED-CONF-65-344-1
CONF-651133–		**(Northeast Electronic Research Engineering Meeting, Newton, Mass., Nov. 3–5, 1965)**
1	20-36020	ORAU. Gmelin, AED-CONF-65-404-1
CONF-660103–		**(4th Anniversary Symposium on Resonant States of Elementary Particles, Madras, India, Jan. 3–11, 1966)**
1	20-36044	See UCRL-16744
CONF-660114–		**(27th Annual Mining Symposium, Duluth, Minn., Jan. 12, 1966)**
1	20-35603	
CONF-660204–		**(American Nuclear Society Meeting, San Diego, Calif., Feb. 7–9, 1966)**
16	20-36139	See GA-7055
CONF-660207–		**(Radioisotope Applications in Aerospace Symposium, Dayton, Ohio, Feb. 15–17, 1966)**
22	20-36353	ORAU. Gmelin, AED-CONF-66-011-36
CONF-660208–		**(Symposium on Solidification and Long-Term Storage of Highly Radioactive Wastes, Richland, Wash., Feb. 14–18, 1966)**
9	20-36534	See BNWL-200
CONF-660219–		**(Society for Radiological Protection, Symposium on Dose Measurement Techniques Under Development, London, England, Feb. 15, 1966)**
1	20-35758	See PG-Report-711
CONF-660303–		**(American Physical Society, Conference of Neutron Cross Section Technology, Washington, D. C., Mar. 22–24, 1966)**
43	20-36160	See GA-7060
44	20-36428	See GA-7072
46	20-36178	See UCRL-14575
CONF-660310–		**(AIAA 5th Electric Propulsion Conference, San Diego, Calif., Mar. 7–9, 1966)**
10	20-36346	ORAU. Gmelin, AED-CONF-66-074-1
CONF-660331–		**(Mantles of the Earth and Terrestrial Planets Meeting, Newcastle-upon-Tyne, England, Mar. 30–Apr. 7, 1966)**
1	20-35986	See UCSD-34P43-5
CONF-660401–		**(American Meteorological Society, American Geophysical Union, Annual Joint Meeting, Washington, D. C., Apr. 19, 1966)**
3	20-36116	ORAU. Gmelin, AED-CONF-66-061-8
CONF-660425–		**(Conference on Two Particle Interactions, New York, Apr. 22, 1966)**
1	20-36023	See CALT-68-70
CONF-660510–		**(International Conference on Isochronous Cyclotrons, Gatlinburg, Tenn., May 2–5, 1966)**
13	20-35962	See ORO-3398-5
14	20-35973	See UCRL-16793
17	20-35972	See UCRL-16792
CONF-660521–		**(International Symposium on In-Pile Irradiation Equipment and Techniques, Harwell, England, May 10–12, 1966)**
2	20-36451	See AECL-2568
CONF-660528–		**(9th Modulator Symposium, Fort Monmouth, N. J., May 12, 1966)**
3	20-35957	See LA-DC-7775
4	20-35966	See SLAC-PUB-193
CONF-660530–		**(4th Symposium on Engineering Problems in Thermonuclear Research, Frascati, Italy, May 23–27, 1966)**
11	20-36279	See CLM-R-59
CONF-660541–		**(International Symposium on Microwave Theory and Techniques, Palo Alto, Calif., May 1966)**
1	20-35965	See SLAC-PUB-181
CONF-660544–		**(Swiss Electrical Engineering Society, Superconductivity Conference, Zurich, Switzerland, May 17–18, 1966)**
1	20-36125	See SLAC-PUB-182
CONF-660605–		**(Cryogenic Engineering Conference, Boulder, Colo., June 13–15, 1966)**
4	20-36123	See LA-DC-7806(Rev.)
5	20-35807	See LA-DC-7654
CONF-660606–	**20-34872**	**(American Nuclear Society Meeting, Denver, June 19–23, 1966) Trans. Amer. Nucl. Soc., 9: 1-322(1966)**
9	20-35859	Dep. mn. CFSTI $3.00 cy, $0.75 mn
10	20-36425	Dep. mn. CFSTI $2.00 cy, $0.50 mn
11	20-36426	Dep. mn. CFSTI $2.00 cy, $0.50 mn
12	20-35472	Dep. mn. CFSTI $1.00 cy, $0.50 mn
13	20-36143	See WAPD-T-1885
CONF-660608–		**(2nd AIAA Propulsion Joint Specialist Conference, Colorado Springs, June 13–17, 1966)**
9	20-36516	See LA-DC-7781
CONF-660609–		**(International Symposium on Food Irradiation Meeting, Karlsruhe, Germany, June 6–10, 1966)**
3	20-35815	See AECL-2422
CONF-660611–		**(Society of Applied Spectroscopy Meeting, Chicago, June 14–15, 1966)**
2	20-35961	See ORO-3398-4
CONF-660621–		**(Health Physics Society, 11th Annual Meeting, Houston, Tex., June 27–30, 1966)**
2	20-35740	See BNWL-SA-516
5	20-35756	See LA-DC-7702
CONF-660623–		**(Symposium on Medical Physics, Madison, Wis.,**

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	June 9–11, 1966)	
1	20-35744	See DP-MS-66-29
CONF-660624–	(EAES Symposium on Advances in Reactor Theory, Karlsruhe, Germany, June 27–29, 1966)	
1	20-36529	Dep. mn. CFSTI $2.00 cy, $0.50 mn
CONF-660626–	(2nd Bolton Landing Conference, New York, June 27–29, 1966)	
1	20-35898	See UCRL-16803
CONF-660628–	(International Inst. of Refrigeration Commission I Meeting, Boulder, Colo., June 16–18, 1966)	
1	20-36121	See LA-DC-7794
2	20-36120	See LA-DC-7793
3	20-36122	See LA-DC-7801
CONF-660631–	(Scientific Computing Symposium, Yorktown Heights, N. Y., June 20–21, 1966)	
1	20-35739	See BNL-10326
CONF-660709–	(5th International Symposium on Rarefied Gas Dynamics, Oxford, England, July 4–8, 1966)	
1	20-36276	See BNL-10330
CONF-660903–	(American Inst. of Chemical Engineers Meeting, Atlantic City, N. J., Sept. 18–21, 1966)	
1	20-35606	See BNL-10257
CONF-660904–	(9th Air Cleaning Conference, Boston, Mass., Sept. 13–16, 1966)	
2	20-35608	See DP-MS-66-52
CONF-660906–	(International Conference on Nuclear Physics, Gatlinburg, Tenn., Sept. 12–17, 1966)	
1	20-35969	See UCD-CNL-49
COO–		
264-308	20-36061	Dep. mn. CFSTI $1.00 cy, $0.50 mn
614-45	20-35829	Dep. mn. CFSTI $5.00 cy, $1.00 mn
1420-124	20-36155	Dep. mn. CFSTI $3.00 cy, $0.50 mn
1428-16	20-36024	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1573-1	20-36156	Dep. mn. CFSTI $4.00 cy, $0.75 mn
1617-1	20-35556	J. Phys. Chem., 70: 2417-18(1966)
CRRP–	(Canadian)	
1235	20-36427	Dep. mn. AECL $3.00
CU–	(Misc.)	
255	20-36021	See AD-635846
1019-51	20-36157	Dep. mn. CFSTI $1.00 cy, $0.50 mn
DESY–	(German)	
66/9	20-36025	Dep. mn
66/13	20-36347	Dep. mn
66/14	20-36062	Dep. mn
66/15	20-36026	Dep. mn
DOCKET	(Misc.)	
50-245(Vol.1)	20-36484	See NP-16147(Vol.1)
50-245(Vol.2)	20-36485	See NP-16147(Vol.2)
50-250(Vol.1)	20-36481	See NP-16146(Vol.1)
50-250(Vol.2)	20-36482	See NP-16146(Vol.2)
50-250(Vol.3)	20-36483	See NP-16146(Vol.3)
50-251(Vol.1)	20-36481	See NP-16146(Vol.1)
50-251(Vol.2)	20-36482	See NP-16146(Vol.2)
DP–		
1008	20-35847	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1009	20-35567	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1023	20-35848	Dep. mn. CFSTI $2.00 cy, $0.50 mn
DP-MS–		
66-29	20-35744	Dep. mn. CFSTI $1.00 cy, $0.50 mn
66-52	20-35608	Dep. mn. CFSTI $1.00 cy, $0.50 mn
DPST–		
66-83-5	20-35835	Dep. mn. CFSTI $1.00 cy, $0.50 mn
DRI–	(Misc.)	
1092-232	20-35885	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2335	20-35885	See DRI-1092-232
DUBNA REPORTS	(Russian)	
See JINR (Russian)		
EANDC–	(European-American Nuclear Data Committee)	
55(U)	20-36158	Dep. mn
ECOM–	(Non-AEC)	
2710	20-35948	See AD-635253
EE–	(Misc.)	
3930-103-66U	20-35998	See ORO-2911-7
EFINS–	(Misc.)	
66-19	20-36061	See COO-264-308
EOS–	(Non-AEC)	
6961-Final	20-35983	See N-66-17619
ER–	(Misc.)	
19	20-36284	See NP-16152
21	20-36286	See NP-16160
EUR–	(European Atomic Energy Community)	
2255.i	20-35207	Boll. Soc. Ital. Biol. Sper., 40: 643-5(1964)
2840	20-35585	See EURAEC-1639
2844	20-35586	See EURAEC-1646
2849	20-35860	See EURAEC-1651
2865	20-35618	See EURAEC-1674
2952.i	20-35393	Dep. mn
2962.f	20-36465	Dep. mn
2985.e	20-35745	Dep. mn
2995.e	20-36466	Dep. mn
3000.e	20-36467	Dep. mn
EURAEC–		
1639	20-35585	Dep. mn. CFSTI $4.00 cy, $1.00 mn
1646	20-35586	Dep. mn. CFSTI $3.00 cy, $0.75 mn
1651	20-35860	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1674	20-35618	Dep. mn. CFSTI $1.00 cy, $0.50 mn
EURFNR–	(Misc.)	
68F	20-36497	Dep. mn. JCL $3.60 fs, $1.13 mf
F–	(Misc.)	
B2196	20-35892	See NYO-3347-1
FTD-TT–	(Non-AEC)	
65-1889	20-35765	For translation see AD-630996
GA–	(Misc.)	
5366	20-36468	Dep. mn. CFSTI $4.00 cy, $1.00 mn
6997	20-36159	
7041	20-35394	Dep. mn. CFSTI $3.00 cy, $0.75 mn
7055	20-36139	Dep. mn. CFSTI $3.00 cy, $0.75 mn
7060	20-36160	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7072	20-36428	Dep. mn. CFSTI $2.00 cy, $0.50 mn
7077	20-36429	Dep. mn. CFSTI $2.00 cy, $0.50 mn
7091	20-36140	Dep. mn. CFSTI $6.00 cy, $1.25 mn
7091(App.C)	20-36430	
GAMD–	(Misc.)	
6334	20-36446	Dep. mn. CFSTI $5.00 cy, $1.00 mn
GD/A–	(Non-AEC)	
AKM-64-032	20-36349	See N-66-18473
GE-TM–		
66-6-23	20-35859	See CONF-660606-9
GEAP–	(Misc.)	
4813	20-36469	Dep. mn. CFSTI $2.00 cy, $0.50 mn
4870	20-36470	Dep. mn. CFSTI $2.00 cy, $0.50 mn
4933	20-35619	Dep. mn. CFSTI $2.00 cy, $0.50 mn
4934	20-36471	Dep. mn. CFSTI $4.00 cy, $0.75 mn
5157	20-35620	Dep. mn. CFSTI $2.00 cy, $0.50 mn
5161	20-35621	Dep. mn. CFSTI $1.00 cy, $0.50 mn
GPI–	(Canadian)	
59	20-35730	See AECL-2569
HEPL–	(Misc.)	

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442	20-35965	See SLAC-PUB-181
HIT–		
3616-4	20-36472	Dep. mn. CFSTI $3.00 cy, $0.75 mn
IA–	**(Non-AEC)**	
1037	20-35995	Dep. mn
IAEA–	**(International Atomic Energy Agency)**	
3498-14	20-36530	Dep. mn. CFSTI $1.00 cy, $0.50 mn
IBJ–	**(Polish)**	
See INR		
IC–	**(Misc.)**	
66/62	20-36161	Dep. mn
66/65	20-36063	Dep. mn
66/70	20-36064	Dep. mn
66/71	20-36065	Dep. mn
66/73	20-36027	Dep. mn
66/74	20-36028	Dep. mn
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66/84	20-36030	Dep. mn
66/85	20-36068	Dep. mn
66/86	20-36069	Dep. mn
66/87	20-36070	Dep. mn
IDO–		
17182	20-35667	Dep. mn. CFSTI $7.00 cy, $1.50 mn
17190	20-36473	Dep. mn. CFSTI $5.00 cy, $1.00 mn
IEA–	**(Brazilian)**	
101	20-35587	Dep. mn
103	20-35568	Dep. mn
104	20-35715	Dep. mn
106	20-36162	Dep. mn
107	20-36141	Dep. mn
108	20-35746	Dep. mn
114	20-35747	Dep. mn
IFA-FT–	**(Rumanian)**	
58	20-36071	Dep. mn
59	20-36072	Dep. mn
IFA-NR–	**(Rumanian)**	
24	20-36163	Dep. mn
IFJ–	**(Polish)**	
See INP		
IITRI–	**(Misc.)**	
578P21-20	20-36406	Dep. mn. CFSTI $2.00 cy, $0.50 mn
T6042-20	20-36406	See IITRI-578P21-20
INP–	**(Polish)**	
457/PL	20-35748	Dep.
INR–	**(Non-AEC)**	
668/I/PH	20-36164	Dep.
674/XVI/J	20-35569	Dep.
684/II/PH	20-36357	Dep. mn
688/I/PH	20-36165	Dep.
706/C	20-36474	Dep.
INSJ–	**(Japanese)**	
98	20-36166	Dep. mn
IPST-Cat.–	**(Russian)**	
1240	20-36183	For translation see AEC-tr-6465
IS-T–		
41	20-35473	Dep. mn. CFSTI $4.00 cy, $0.75 mn
80	20-35886	Dep. mn. CFSTI $4.00 cy, $1.00 mn
89	20-35474	Dep. mn. CFSTI $4.00 cy, $1.00 mn
92	20-35887	Dep. mn. CFSTI $4.00 cy, $0.75 mn
93	20-35475	Dep. mn. CFSTI $3.00 cy, $0.75 mn
ISS–	**(Italian)**	
66/11	20-35749	Dep. mn
66/12	20-35750	Dep. mn
66/13	20-35751	Dep. mn
66/14	20-35752	Dep. mn
66/20	20-36167	Dep. mn
ITEF–	**(Russian)**	
394	20-36117	Dep. mn
395	20-36073	Dep. mn
398	20-36031	Dep. mn
401	20-36032	Dep. mn
416	20-36475	Dep. mn
417	20-36074	Dep. mn
JINR–	**(Russian)**	
E-2714	20-36075	Dep. mn
E-2743	20-36033	Dep. mn
P-2696	20-36076	Dep. mn
P-2706	20-35955	Dep. mn
P-2707	20-35753	Dep. mn
P-2713	20-36168	Dep. mn
P-2725	20-36169	Dep. mn
P-2727	20-35754	Dep. mn
P-2730	20-35956	Dep. mn
P-2735	20-35996	Dep. mn
P-2739	20-36170	Dep. mn
P-2744	20-36034	Dep. mn
P-2757	20-36035	Dep. mn
KFK–	**(German)**	
384	20-36431	Dep. mn
KFK-tr–	**(German)**	
193	20-36292	Dep. mn. JCL $2.60 fs, $1.10 mf
KR–	**(Norwegian)**	
89	20-36476	Dep. mn
107	20-36529	See CONF-660624-1
L–	**(Misc.)**	
0740-05-17	20-36519	See NP-16166
LA–		
3332	20-35890	Dep. mn. CFSTI $2.00 cy, $0.50 mn
3396	20-36514	Dep. mn. CFSTI $3.00 cy, $0.75 mn
3447	20-36515	Dep. mn. CFSTI $1.00 cy, $0.50 mn
3466	20-36085	Dep. mn. CFSTI $5.00 cy, $1.00 mn
3491	20-35668	Dep. mn. CFSTI $3.00 cy, $0.50 mn
3498	20-35755	Dep. mn. CFSTI $2.00 cy, $0.50 mn
3501	20-35932	Dep. mn. CFSTI $2.00 cy, $0.50 mn
3503	20-35588	Dep. mn. CFSTI $1.00 cy, $0.50 mn
3520	20-35640	Dep. mn. CFSTI $2.00 cy, $0.50 mn
LA-DC–		
7654	20-35807	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7702	20-35756	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7775	20-35957	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7781	20-36516	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7793	20-36120	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7794	20-36121	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7801	20-36122	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7805	20-35908	J. Chem. Phys., 45: 547-9(1966)
7806(Rev.)	20-36123	Dep. mn. CFSTI $1.00 cy, $0.50 mn
LAL–	**(French)**	
1159	20-35958	Dep. mn
LNF–	**(Italian)**	
66/18	20-35959	Dep. mn
66/20	20-36036	Dep. mn
66/23	20-36037	Dep. mn
LRP–	**(Swiss)**	
25/66	20-36280	Dep. mn
26/66	20-36281	Dep. mn
LYCEN–	**(French)**	
6623	20-36282	Dep. mn
MATT–		
326	20-36297	Nucl. Fusion, 6: 101-17(1966)
403	20-36303	Phys. Fluids, 9: 1380-5(1966)
MD–	**(Misc.)**	

Report No.	Abstract No.	Availability
66-2	20-35897	See UCRL-13212
MF–	**(Misc.)**	
51	20-36107	See NYO-1480-55
MIT–	**(Misc.)**	
905-49	20-35487	Anal. Chim. Acta, 35: 441-6(1966)
2241-23	20-35642	Tellus, 18: 1-18(1966)
MLM–		
1299	20-35536	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1300	20-35828	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1314J	20-35909	J. Inorg. Nucl. Chem., 28: 1581-8(1966)
MUC-JCW–		
223(Bks.1&2)	20-35383	Dep. CFSTI $5.50 cy, $2.25 mn
N–	**(Misc.)**	
65-36572	20-36014	See AD-621726
66-17353	20-36283	CFSTI $4.00 cy, $0.75 mn
66-17566	20-36348	CFSTI $3.00 cy, $0.75 mn
66-17619	20-35983	CFSTI $6.00 cy, $1.25 mn
66-17887	20-35850	CFSTI $2.00 cy, $0.50 mn
66-18121	20-36077	CFSTI $1.00 cy, $0.50 mn
66-18122	20-36038	CFSTI $1.00 cy, $0.50 mn
66-18134	20-36039	CFSTI $1.00 cy, $0.50 mn
66-18151	20-36078	CFSTI $3.00 cy, $0.75 mn
66-18156	20-35933	CFSTI $2.00 cy, $0.50 mn
66-18361	20-35984	CFSTI $2.00 cy, $0.50 mn
66-18378	20-35808	CFSTI $1.00 cy, $0.50 mn
66-18395	20-35997	CFSTI $1.00 cy, $0.50 mn
66-18407	20-36015	CFSTI $4.00 cy, $1.00 mn
66-18473	20-36349	CFSTI $1.00 cy, $0.50 mn
NAA-SR–		
128	20-35934	Dep. mn. CFSTI $3.00 cy, $0.75 mn
6322	20-36517	Dep. mn. CFSTI $3.00 cy, $0.75 mn
11900	20-35841	Dep. mn. CFSTI $5.00 cy, $1.00 mn
NAA-SR-Memo–		
8925	20-36407	Dep. mn. CFSTI $3.00 cy, $0.75 mn
NASA-CR–	**(Misc.)**	
487	20-36518	CFSTI $5.00 cy, $1.00 mn
54505	20-36349	See N-66-18473
54933	20-36159	See GA-6997
70097	20-35983	See N-66-17619
70388	20-36283	See N-66-17353
70519	20-35933	See N-66-18156
70587	20-36015	See N-66-18407
NASA-SP–	**(Misc.)**	
3027	20-36096	CFSTI $5.50 cy, $2.25 mn
7026	20-35985	CFSTI $2.50 cy, $1.25 mn
NASA-TM–	**(Misc.)**	
X-1260	20-36142	CFSTI $2.00 cy, $0.50 mn
X-52166	20-36348	See N-66-17566
X-53444	20-35865	See RSIC-491
X-55401	20-35997	See N-66-18395
X-56171	20-35984	See N-66-18361
X-56306	20-35808	See N-66-18378
NASA-TN–	**(Misc.)**	
D-3503	20-35476	CFSTI $1.00 cy, $0.50 mn
NASA-TR–	**(Non-AEC)**	
R-232	20-35850	See N-66-17887
NBS–	**(Misc.)**	
8815	20-36097	
NDL-TM–	**(Non-AEC)**	
30	20-35727	See AD-635169
NDL-TR–	**(Non-AEC)**	
76	20-35726	See AD-634718
NEVIS–	**(Misc.)**	
151	20-36021	See AD-635846
NP–	**(AEC File No. for Non-AEC Reports)**	
16006	20-36408	Dep. mn
16146(Vol.1)	20-36481	Dep. mn. CFSTI $5.00 cy, $1.00 mn
16146(Vol.2)	20-36482	Dep. mn. CFSTI $6.00 cy, $1.25 mn
16146(Vol.3)	20-36483	Dep. mn. CFSTI $6.00 cy, $1.25 mn
16147(Vol.1)	20-36484	Dep. mn. CFSTI $7.09 cy, $2.00 mn
16147(Vol.2)	20-36485	Dep. mn. CFSTI $6.00 cy, $1.50 mn
16149	20-35633	Dep. mn
16152	20-36284	Dep. mn
16154	20-36285	Dep. mn. BIS
16155	20-36171	Dep. mn
16160	20-36286	Dep. mn
16166	20-36519	
16169	20-35960	Dep. mn
16170	20-35589	Dep. mn
16171	20-36539	Dep. mn
16188	20-36486	Dep. mn
16190	20-36172	Dep. mn
16213	20-35635	
NP-tr–	**(AEC File No. for Non-AEC Translations)**	
1389	20-35483	Dep. mn. CFSTI $1.00 cy, $0.50 mn. JCL $1.10 fs, $0.80 mf
NYO–		
901-52	20-35324	Arch. Pathol., 82: 115-18(1966)
1480-48	20-35830	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1480-55	20-36107	Dep. mn. CFSTI $2.00 cy, $0.50 mn
2082-4	20-35477	Dep. mn. CFSTI $2.00 cy, $0.50 mn
2262TB-125	20-36040	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2397-2	20-36287	Dep. mn. CFSTI $2.00 cy, $0.50 mn
2731-7(App.1)	20-35891	Dep. mn. CFSTI $3.00 cy, $0.75 mn
2930-7	20-35622	Dep. mn. CFSTI $3.00 cy, $0.75 mn
3347-1	20-35892	Dep. mn. CFSTI $3.00 cy, $0.50 mn
3454-5	20-36376	pp 1-8 of Solid State Session P-2. Book Four [of Preprints of] Fifth Rare Earth Research Conference, Aug. 30–Sept. 1, 1965
3608-2	20-35478	Dep. mn. CFSTI $1.00 cy, $0.50 mn
ORNL–		
3795(Pts.1&2) (Suppl.)	20-35842	Dep. mn. CFSTI $1.00 cy, $0.50 mn
3901(Pt.1)	20-36401	Dep. mn. CFSTI $3.00 cy, $0.50 mn
3931	20-36173	Dep. mn. CFSTI $3.00 cy, $0.75 mn
3951	20-36487	Dep. mn. CFSTI $6.00 cy, $1.25 mn
3960	20-35395	Dep. mn. CFSTI $3.00 cy, $0.75 mn
3977	20-35590	Dep. mn. CFSTI $2.00 cy, $0.50 mn
3986	20-35831	Dep. mn. CFSTI $3.00 cy, $0.50 mn
ORNL-P–	**(Misc.)**	
257	20-35210	Ecology, 47: 1-8(1966)
1083	20-35853	Corrosion, 22: 194-7(1966)
1407	20-35278	Health Phys., 12: 949-53(1966)
1466	20-35596	J. Inorg. Nucl. Chem., 28: 1723-31(1966)
1471	20-35361	Health Phys., 12: 971-3(1966)
1834	20-35941	Nucl. Sci. Eng., 25: 319-27(1966)
1887	20-36307	Phys. Fluids, 9: 1403-6(1966)
1918	20-36440	Nucl. Sci. Eng., 25: 444-5(1966)
2015	20-35495	J. Appl. Polymer Sci., 10: 969-79(1966)
2063	20-36300	Phys. Fluids, 9: 1362-6(1966)
2123	20-36200	Nucl. Phys., 85: 273-87(1966)
ORNL-TM–		
989(Suppl.1)	20-35384	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1454	20-35479	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1456	20-35895	Dep. mn. CFSTI $1.00 cy, $0.50 mn
1471	20-36508	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1495	20-35863	Dep. mn. CFSTI $1.00 cy, $0.50 mn
1506	20-35591	Dep. mn. CFSTI $1.00 cy, $0.50 mn
1536	20-35480	Dep. mn. CFSTI $7.00 cy, $1.75 mn
1572	20-35528	Dep. mn. CFSTI $1.00 cy, $0.50 mn
1575	20-35832	Dep. mn. CFSTI $2.00 cy, $0.50 mn
ORO–		
647	20-35812	Dep. mn. CFSTI $3.00 cy, $0.75 mn
2073-11	20-35481	Dep. mn. CFSTI $[illegible].00 cy, $0.50 mn
2504-90	20-36041	Dep. mn. CFSTI $3.00 cy, $0.50 mn
2911-7	20-35998	Dep. mn. CFSTI $1.00 cy, $0.50 mn
3398-4	20-35961	Dep. mn. CFSTI $1.00 cy, $0.50 mn
3398-5	20-35962	Dep. mn. CFSTI $1.00 cy, $0.50 mn
PAEC(A)IN–	**(Philippines)**	

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658	20-35757	Dep. mn
PAN–	**(Polish)**	**(This series of reports was terminated in 1965. Subsequent reports are identified by the code INR.)**
PATENTS	**(French)**	
1,338,474	20-36411	
1,347,127	20-36414	
1,349,565	20-36503	
1,352,155	20-36412	
1,352,844	20-36415	
1,354,119	20-36416	
1,368,086	20-36443	
1,370,932	20-36501	
1,375,799	20-36445	
1,378,435	20-36093	
1,395,221	20-36413	
1,396,030	20-36505	
1,401,115	20-36504	
1,406,428	20-36502	
1,409,175	20-36444	
PATENTS	**(Japanese)**	
1964-29696	20-35468	
1965-3879	20-35566	
1965-5000	20-35710	
1965-7440	20-35980	
1965-7760	20-35979	
1965-7960	20-35978	
1965-8320	20-36417	
1965-14240	20-35977	
1965-14359	20-35976	
1965-29697	20-35469	
PATENTS	**(U. S.)**	**($0.50 each, U. S. Patent Office)**
3,259,470	20-35878	
3,261,756	20-35879	
3,263,004	20-35877	
3,264,073	20-35880	
3,266,928	20-35875	
3,266,948	20-35876	
3,268,976	20-35881	
3,270,098	20-35874	
PG-Report–	**(British)**	
709	20-35396	Dep. BIS $0.50. HMSO 2s. 6d.
711	20-35758	Dep. BIS $0.80. HMSO 4s. 0d.
PIBMRI–	**(Non-AEC)**	
1304-65	20-36273	See AD-633653
1320-66	20-36274	See AD-633726
PNE–		
515	20-35604	Dep. mn. CFSTI $2.00 cy, $0.50 mn
PUC–		
937-163	20-36174	Dep. mn. CFSTI $7.03 cy, $1.75 mn
R–	**(Misc.)**	
551	20-36021	See AD-635846
2370	20-35586	See EURAEC-1646
RFP–		
741	20-35864	Dep. mn. CFSTI $2.00 cy, $0.50 mn
RHEL-R–	**(British)**	
115	20-35963	Dep. mn. BIS $1.10. HMSO 5s. 6d.
118	20-36124	Dep. mn. BIS $0.50. HMSO 2s. 6d.
122	20-35964	Dep. mn. BIS $2.40. HMSO 12s.
RISO–	**(Danish)**	
123	20-36409	Dep. mn
RISO-M–	**(Danish)**	
399	20-36016	Dep. mn
RMO–		
3005(Suppl.)	20-36535	Dep. mn. CFSTI $1.00 cy, $0.50 mn
RRL–		
2310-168	20-35552	J. Phys. Chem., 70: 2224-32(1966)
RSIC–	**(Non-AEC)**	
491	20-35865	
RT-EL–	**(Italian)**	
(66)2	20-35759	Dep. mn
RT-FI–	**(Italian)**	
(66)8	20-36175	Dep. mn
SC-R–		
66-914	20-35601	Dep. mn. CFSTI $1.00 cy, $0.50 mn
SC-TM–		
66-232	20-35760	Dep. mn. CFSTI $1.00 cy, $0.50 mn
SCL-DC–		
66-52	20-35866	Dep. mn. CFSTI $1.00 cy, $0.50 mn
SFL–	**(Finnish)**	
A2	20-35397	Dep. mn
SGAE-CH–	**(Austrian)**	
29/1966	20-35592	Dep. mn
32/1966	20-35398	Dep. mn
SGAE-PH–	**(Austrian)**	
40/1966	20-35999	Dep. mn
43/1966	20-36358	Dep. mn
SLAC-PUB–		
181	20-35965	Dep. mn. CFSTI $1.00 cy, $0.50 mn
182	20-36125	Dep. mn. CFSTI $2.00 cy, $0.50 mn
193	20-35966	Dep. mn. CFSTI $1.00 cy, $0.50 mn
STI-PUB–	**(International Atomic Energy Agency)**	
21-18	20-35761	IAEA: $8.00; S168,-; £2.8.0; F Fr 32,-; DM 28,-
114	20-35669	IAEA: $15.00; S315,-; £4.10.0; F Fr 60,-; DM 52,50
SU-IPR–	**(Misc.)**	
53	20-36288	Dep. mn. CFSTI $5.00 cy, $1.25 mn
76	20-36289	Dep. mn. CFSTI $2.00 cy, $0.50 mn
TH–	**(Non-AEC)**	
122	20-36077	See N-66-18121
127	20-36038	See N-66-18122
128	20-36039	See N-66-18134
TID–		
22431	20-36436	Nucl. Sci. Eng., 25: 377-82(1966)
22937	20-35762	Dep. mn. CFSTI $1.00 cy, $0.50 mn
22971	20-35967	Dep. mn. CFSTI $5.00 cy, $1.00 mn
22992	20-36359	Dep. mn. CFSTI $4.00 cy, $1.00 mn
23132	20-36000	Dep. mn. CFSTI $1.00 cy, $0.50 mn
23138	20-35896	Dep. mn. CFSTI $1.00 cy, $0.50 mn
23144	20-36290	Dep. mn. CFSTI $3.00 cy, $0.50 mn
23191	20-36042	Dep. mn. CFSTI $6.00 cy, $1.50 mn
23199	20-35497	J. Chem. Phys., 45: 434-43(1966)
23206	20-36043	Dep. mn. CFSTI $1.00 cy, $0.50 mn
23220	20-35498	J. Chem. Phys., 45: 444-50(1966)
23221	20-36291	Dep. mn. CFSTI $2.00 cy, $0.50 mn
TP–	**(British)**	
209	20-36205	Nucl. Phys., 85: 365-92(1966)
TR–	**(Misc.)**	
65-363-2	20-35933	See N-66-18156
TRG-Report–	**(British)**	
1180	20-35867	Dep. BIS $1.00. HMSO 5s.
1207	20-36493	Dep. BIS $0.90. HMSO 4s. 6d.
1210	20-36497	Dep. BIS $0.30. HMSO 1s. 3d.
TRW-ER–	**(Misc.)**	
6660	20-36517	See NAA-SR-6322
TUBIK–	**(German)**	
1	20-35602	Dep. mn
UCD-CNL–		

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49	20-35969	Dep. mn. CFSTI $1.00 cy, $0.50 mn
UCRL–		
7645	20-36368	Surface Sci., 1: 367-77(1964)
10851	20-35648	Health Phys., 12: 935-41(1966)
10851(Rev.)	20-35648	See UCRL-10851
11980	20-36177	Dep. mn. CFSTI $6.00 cy, $1.75 mn
12172	20-35605	Dep. mn. CFSTI $2.00 cy, $0.75 mn
12455(Rev.2)	20-36311	Phys. Fluids, 9: 1425-7(1966)
13212	20-35897	Dep. mn. CFSTI $1.00 cy, $0.50 mn
14440(Rev.1)	20-35399	Dep. mn. CFSTI $1.50 cy, $0.50 mn
14575	20-36178	Dep. mn. CFSTI $1.00 cy, $0.50 mn
14786	20-35670	Dep. mn. CFSTI $2.00 cy, $0.50 mn
14903	20-35671	Dep. mn. CFSTI $2.00 cy, $0.50 mn
14931	20-36086	Dep. mn. CFSTI $3.00 cy, $0.50 mn
16554	20-35970	Dep. mn. CFSTI $1.00 cy, $0.50 mn
16741	20-35971	Dep. mn. CFSTI $1.00 cy, $0.50 mn
16744	20-36044	Dep. ma. CFSTI $3.00 cy, $0.75 mn
16792	20-35972	Dep. mn. CFSTI $2.00 cy, $0.50 mn
16793	20-35973	Dep. mn. CFSTI $1.00 cy, $0.50 mn
16803	20-35898	Dep. mn. CFSTI $2.00 cy, $0.50 mn
16865	20-35482	Dep. mn. CFSTI $3.00 cy, $0.75 mn
16869	20-35764	Dep. mn. CFSTI $1.00 cy, $0.50 mn
16874	20-36045	Dep. mn. CFSTI $3.00 cy, $0.50 mn
16880	20-35400	Dep. mn. CFSTI $1.00 cy, $0.50 mn
UCRL-Trans–		
10027	20-35484	Dep. mn. JCL $1.60 fs, $0.80 mf
UCSD–		
34P43-5	20-35986	Dep. mn. CFSTI $1.00 cy, $0.50 mn
UJV–	**(Czechoslovakian)**	
1408/66	20-35974	Dep. mn
1612	20-36179	Dep. mn
USC–		
136-100	20-36180	Dep. mn. CFSTI $1.00 cy, $0.50 mn
USNRDL-TR–	**(Misc.)**	
1009	20-36181	Dep. mn. CFSTI $5.00 cy, $1.00 mn
1019	20-36153	See AD-635252
1021	20-35729	See AD-635882
1036	20-35851	Dep. mn. CFSTI $1.00 cy, $0.50 mn
UU–	**(Non-AEC)**	
66-8	20-36094	See AD-635604
WAPD-T–		
1885	20-36143	Dep. mn. CFSTI $1.00 cy, $0.50 mn
WAPD-TM–	**(Misc.)**	
530	20-35625	Dep. mn. CFSTI $3.00 cy, $0.75 mn
545	20-35626	Dep. mn. CFSTI $2.00 cy, $0.50 mn
604	20-36495	Dep. mn. CFSTI $3.00 cy, $0.75 mn
WCAP–	**(Misc.)**	
2828	20-36432	
6080	20-36496	Dep. mn. CFSTI $4.00 cy, $0.75 mn
WW–	**(Dutch)**	
016-R94	20-35618	See EURAEC-1674
X–	**(Misc.)**	
641-65-474	20-35997	See N-66-18395
Y–		
1542	20-35401	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1547	20-35610	Dep. mn. CFSTI $1.00 cy, $0.50 mn
ZFK-RN–	**(German)**	
32	20-36360	Dep. mn
33	20-36144	Dep. mn
ZFK-TPH–	**(German)**	
19	20-36182	Dep. mn

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IRELAND
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